Vehicle Speeds and Fuel Conservation Survey, October 1982

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Prepared by:
J. Bylok
STATistiSEARCH Consultants

Project Monitor
P. Salerno
Research Officer
Transportation Energy Management Office, MTC

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Project Team:
J. Bylok (Consultant)
STATistiSEARCH
P. Salerno (Project Monitor)
MTC

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EXECUTIVE SUMMARY

The Ontario Government reduced speed limits on most highways in the province in February of 1976. The 1982 Speeds Analysis and Fuel Conservation survey was concerned with analyzing October 1982 average vehicle speed and traffic flow variables and comparing these parameters with May 1977 data. Another key objective of the survey was assessing the fuel consumption and conservation implications arising from any significant changes in average vehicle speeds over the intervening period. A total of 79 highway sites were sampled throughout Ontario. The sites were grouped into six before legislation-after legislation speed limit categories. These categories included highways with 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 km/h before-after speed limits. Some of the key findings of the study are highlighted below.

1. The average vehicle speed for most of the speed limit categories increased from May 1977 to October 1982. The average speeds increased by 3.7 km/h (101.1 to 104.8 km/h), 3.0 km/h (95.2 to 98.2 km/h), 2.9 km/h (83.6 to 86.5 km/h) and 1.7 km/h (81.1 to 82.8 km/h) for the 112-100, 100-100, 100-80 and 80-80 km/h speed limit categories. Average speeds remained the same (90.5 km/h) for the 100-90 km/h speed limit category and decreased by 5.7 km/h (90.5 to 84.8 km/h) for the 90-80 km/h speed limit category.

2. The percentage of drivers who were compliant increased significantly for the 100-100 and 100-90 km/h categories (13.8% and 6.5% respectively) and decreased significantly for the 100-80, 90-80 and 80-80 km/h categories (10.3%, 9.5% and 22.6% respectively). Driver compliancy to posted speed limits decreased slightly (2.2%) for the 112-100 km/h speed limit category. Overall compliancy for all Ontario highways with speed limits of at least 80 km/h decreased by 6.9% from May 1977 to October 1982.

3. The pace range (16 km/h vehicle speed range which included the greatest percentage of sampled vehicles) increased by 1 to 4 km/h for the 112-100, 100-100, 90-80 and 80-80 km/h speed limit categories and remained the same for the 100-90 and 100-80 km/h categories.

4. The percentage of vehicles in the pace increased significantly for the 90-80 km/h speed limit category and remained relatively unchanged for the other speed limit categories. The overall percentage of vehicles in the pace decreased by 0.8% which indicated that, in general, the traffic flow on the highways of Ontario had not changed from May 1977 to October 1982.

5. The speed below which 85% of the drivers were travelling (85 th percentile) decreased slightly for the 90-80 km/h speed limit category (down by 3.2 km/h) and increased slightly for the other speed limit categories (a range of +0.3 to +4.5 km/h).

6. The standard deviation measured the variation about the mean operating speed and was related to traffic flow. The results showed that traffic flow was similar in May 1977 and October 1982 as the standard deviations in operating speeds increased by only 0.15 km/h for the 100-90 km/h speed limit category and decreased slightly for the other categories.

7. Compliancy to posted speed limits decreased by 9.5%, 10.5% and 6.4% from May 1977 to October 1982 for drivers travelling on the high (44.4% to 34.9%), medium (50.3% to 39.8%) and low (38.1% to 31.7%) volume areas respectively of Ontario highways.

8. The compliancy rates for drivers travelling on freeways increased slightly from May 1977 to October 1982 (37.8% to 39.6%) and decreased significantly for drivers travelling on 2 lane (42.8% to 34.9%), 3 lane (36.0% to 30.0%), 4 lane undivided (64.3% to 46.3%) and 4 lane divided (92.0% to 63.0%) highways.

9. The overall increase in average vehicle speeds from October 1978 to October 1982, along with increases in million vehicle kilometres travelled, resulted in greater fuel consumption on all Ontario highways with speed limits of at least 80 km/h. Fuel consumption on these highways increased by 0.313 million kilolitres (68.7 million imperial gallons) for all vehicles (automobiles, single and multiple unit trucks). Improved technology in automobile fuel efficiency was not taken into account in calculating fuel consumption. Increased speeds was the only factor used to account for the rise in fuel consumption. The "least squares" method was not used because of a lack of data in some of the interim years.

10. Due to the increases in average vehicle speeds and million vehicle kilometres travelled, fuel consumption increased by 0.122, 0.018, 0.142 and 0.031 million kilolitres from October 1978 to October 1982 for 100 km/h expressways, 90 km/h King's highways, 80 km/h King's highways and 80 km/h secondary roads respectively.

11. Overall automobile, single unit truck and multiple unit truck consumption rates increased by 0.202, 0.034 and 0.075 million kilolitres respectively from October 1978 to October 1982. These increases were related to the overall increases in average vehicle speeds and million vehicle kilometres travelled that occurred from October 1978 to October 1982.

12. The survey showed that fuel consumption, based on average vehicle speeds and million vehicle kilometres travelled, increased from October 1978 to October 1982. Improvements in technology, along with changes in average trip distance and driving time, may, or may not, result in decreased fuel consumption for Ontario. However, the survey findings indicated that 100% driver compliance to existing speed limits (80 km/h, 90 km/h and 100 km/h) in Ontario would result in a fuel consumption saving of 258 million litres (1.65 million barrels).

1/ INTRODUCTION

The Ontario Government enacted legislation on February 1,1976, reducing the speed limits on many highways in the province. Posted speed limits of 112 km/h (70 mph) were lowered to 100 km/h (60 mph) and the speed limits on most 100 km/h highways were set at 80 km/h (50 mph). There were also some highways in Ontario where the speed limits remained at either 100 km/h or 80 km/h and others where the speed limits were reduced from 100 km/h to 90 km/h (55 mph).

The 1982 Speeds Analysis and Fuel Conservation survey was concerned with analyzing October 1982 average vehicle speed and traffic flow variables and comparing these parameters with May 1977 data. Another key objective of the survey was assessing the fuel consumption and conservation implications arising from any significant changes in average speeds over the intervening period (May 1977 to October 1982).

1.1/ SITES (STATIONS AND SAMPLE SIZES)

There were 79 sites sampled in the October 1982 survey (see Appendix A). These sites were categorized by speed limit change, type of highway, AADT level and region.

The survey highway sites were broken down into six speed limit categories. These categories were defined by both before legislation and after legislation speed limits and included the following: 112 to 100 km/h (70 to 60 mph), 100 to 100 km/h (60 to 60 mph), 100 to 90 km/h (60 to 55 mph), 100 to 80 km/h (60 to 50 mph), 90 to 80 km/h (55 to 50 mph) and 80 to 80 km/h (50 to 50 mph) before-after speed limits.

The sites were also classified by highway type and included freeways, four (4) lane divided highways, four (4) lane undivided highways, three (3) lane highways and two (2) lane highways.

The AADT represents the annual average daily traffic volume for a particular site (highway location). The AADT's for this sample were divided into the following six levels of traffic volume: HIGH FREEWAY-

freeways with AADT's of over 40,000, MEDIUM FREEWAY- freeways with AADT's of 20,000 to 40,000, LOW FREEWAY- freeways with AADT's of under 20,000, HIGH OTHER- non-freeways with AADT's of over 7,000, MEDIUM OTHER- non-freeways with AADT's of 3,000 to 7,000 and LOW OTHER- non-freeways with AADT's of under 3,000.

For most of the analyses, the three freeway AADT (high, medium and low) categories were combined with the three non-freeway AADT categories in order to obtain three overall AADT categories (High, Medium and Low).

The five regions of the province used in this study (Northwest, North, Central, Southwest and East) are shown in Figure 1.

1.2/ SURVEY SHEET

The survey sheet was designed to obtain valuable speed and traffic flow data for each site (see Appendix B).

The speed statistics either obtained or calculated from the survey sheet included average speed, highest recorded speed (HRS), lowest recorded speed (LRS), pace, percent in pace, percent compliant, 85 th percentile and standard deviation.

1.3/ METHODOLOGY

The Stephenson Radar Speedalyzer was used to measure vehicle speeds. Each site in the survey (N=79) was sampled for two hours, or until the speeds of 100 vehicles were recorded, which ever occurred first. Only the speeds of free-flowing vehicles were recorded (i.e. vehicles which were not impeded by other vehicles immediately ahead of them). The sample at each site was limited to free-flowing traffic in order to ensure that all drivers had the opportunity to comply voluntarily to the posted speed limits.

The data for both cars and trucks were combined at each site. About half the locations (42 of 79) gave separate results for the two directions of traffic. In order to maintain uniformity with the remainder of the sites, the two directions were combined.

1.4/ SURVEY BIAS AND WEIGHTING FORMULA

The average speeds for each speed limit category in this survey were weighted by the total distance travelled per region (see Figure 2) in order to compensate for any bias that might exist in the data due to over-representation of a given geographical region.

The weighting formula involved calculating the million vehicle kilometres travelled (MVkm) for each LHRS (Linear Highway Reference System) section in Ontario and then assigning each of these MVkm's to a particular speed limit category and region. It should be noted that there were approximately 2878 LHRS sections on Ontario's highways.

Once the MVkm's were compiled for each speed limit category, it was possible to weight the average speed data for each speed limit category in each region and thus compensate for any regional bias that might have existed.

The results showed that the weighting changed the average speed for each speed limit category by no more than 1.6 km/h (1.0 mph) which indicated that the sample was representative of the Ontario driving population (see Table 1 for comparisons of weighted and unweighted average speed data for the various speed limit categories).

1.5/ DESCRIPTIVE STATISTICS

The descriptive statistics analyzed in this report (average speed, lowest recorded speed (LRS), highest recorded speed (HRS), percent compliant, pace, percent in pace, standard deviation and 85 th percentile) were obtained or calculated from the raw data survey sheets (see Appendix B).

The average speed at each site represented the mean speed (km/h) at which the sampled vehicles were travelling.

The highest and lowest recorded speeds represented the maximum and minimum speeds at which the samples at each site were travelling.

The percent compliance was a measure which determined the percentage of drivers who were travelling at or below the posted speed limit.

The pace, percent in pace and standard deviation were measures which determined traffic flow variations. The pace was the 16 km/h (10 mph) speed range which included the greatest percentage of vehicle speeds in the sample. The percent in pace represented the percentage of drivers who were travelling in the pace range for each site while the standard deviation (km/h) measured the variation about the mean speed for each site.

The 85 th percentile represented the speed (km/h) below which 85% of the drivers were travelling at each site.

FIGURE 1/ THE FIVE REGIONS OF ONTARIO

FIGURE 2/ MILLION VEHICLE KILOMETRE (MVkm) BREAKDOWN FOR REGIONS AND SPEED LIMIT CATEGORIES

REGION	112-100	100-100	100-90	100-80	90-80	80-80	TOTAL
NORTHWEST	----	----	1056.569	97.224	----	463.282	1617.075
NORTH	----	242.127	1531.004	980.373	----	1198.263	3951.767
SOUTHWEST	2128.508	355.322	47.370	2445.353	575.308	1845 998	7397.859
CENTRAL	6897.652	3216.914	30.155	2031.856	119.899	1910.231	14206.707
EAST	1238.941	90.886	341.924	899.652	----	1445.977	4017.380
TOTAL	10265.101	3905.249	3007.022	6454.458	695.207	6863.751	31190.788

Note: only highways with speed limits of at least 80 km/h were included in the table

2/ ANALYSIS OF 1982 SPEED STATISTICS

2.1/ ANALYSIS OUTLINE

The following sections are concerned with analyses of the various October 1982 speed statistics obtained from the seventy-nine (79) survey stations in this study. These statistics include: average speed, highest recorded speed (HRS), lowest recorded speed (LRS), pace, percent in pace, percent compliant, standard deviation and 85 th percentile. These variables were crosstabulated with each of the six speed limit categories and were also examined in combination with AADT levels and highway types.

The speed statistics were also crosstabulated by region in order to provide interested readers with more detailed breakdowns of data. This information was not included in the main portion of the report due to the small sample sizes available but was listed in Appendix C.

2.2/ AVERAGE SPEED

The average speed for each before-after[1] speed limit category was determined by region and then weighted by the total distance travelled per region. The weighting was designed to compensate for any bias that might exist in the data due to over-representation of a given geographic region (see section 1.4 for a more detailed explanation of the weighting methodology). The weighting caused only very minor changes in the raw average speeds. The average speeds for each of the six speed limit categories changed by only 1.6 km/h or less (see Table 1).

The results showed that the weighted average speeds for highways with before-after speed limits of 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 km/h were 100.9, 97.9, 92.7, 84.4, 84.8 and 83.4 km/h respectively. Table 1 also indicated that the average speed was lower than the posted speed limit for the 100-100 speed limit category (-2.1 km/h) and was higher for the other five speed categories (a range of +0.9 km/h for the 112-100 km/h category to +4.8 km/h for the 90-80 km/h category).

[1] Note: Speed limits were reduced on most Ontario highways in February of 1976. Each speed limit category in this survey was identified by a before and after legislation speed limit in km/h.

2.3/ HIGHEST RECORDED SPEED

The average highest recorded speed was calculated for each speed limit group (see Table 2). The average highest recorded speeds (km/h) for the 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 km/h speed limit categories were 121.2, 121.4, 116.4, 115.1, 103.0 and 109.5 km/h respectively. These results showed that the highest recorded speeds averaged 21.2 km/h to 35.1 km/h over the posted speed limits (see Table 2).

2.4/ LOWEST RECORDED SPEED

Table 3 shows that the average lowest recorded speed for the 112-100 speed limit category was 77.3 km/h while the average lowest speeds for the 100-100, 100-90, 100-80, 90-80 and 80-80 km/h categories were 77.0, 69.4, 64.4, 66.0 and 60.7 km/h respectively. These results indicated that the lowest recorded speeds averaged 14.0 km/h to 23.0 km/h below the posted speed limits.

2.5/ PERCENT COMPLIANT

The percentage of drivers who were compliant to the posted speed limits varied for each speed limit category (see Table 4). Drivers travelling on highways with before-after speed limits of 100-80 km/h and 90-80 km/h were significantly[2] less likely to be compliant (32.0% and 32.5% respectively) than drivers travelling on highways with before-after speed limits of 80-80 km/h, 100-90 km/h, 112-100 km/h and 100-100 km/h (41.7%, 47.0%, 49.5% and 68.4% respectively).

The most compliant drivers in the survey (68.4%) were travelling on highways with before-after speed limits of 100-100 km/h.

The overall percentage of drivers (total) who were compliant to the posted speed limits was 44.7%.

[2]Note: all mention of significance pertains to the 0.05 level.

2.6/ PACE AND PERCENT IN PACE

The pace is the 16 km/h (10 mph) range that includes the greatest percentage of vehicle speeds in the sample. A greater percentage of vehicles in the pace indicates a lower spread of speeds as well as a smoother, more uniform traffic flow.

The survey revealed that the pace for the 112-100 km/h speed limit category was 93 to 109 km/h (see Table 5). The paces for the 100-100, 100-90, 100-80, 90-80 and 80-80 km/h speed limit categories were 90 to 106, 85 to 101, 77 to 93, 79 to 95 and 76 to 92 km/h respectively.

Table 5 also shows that the percentage of vehicles in the pace did not vary greatly for each speed limit category (a range of 67.3% for the 100-80 km/h category to 72.1% for the 112-100 km/h category).

Overall results for the sample showed that 70.1% of the vehicles were travelling in the pace (see Table 5).

2.7/ STANDARD DEVIATION

The standard deviations[3] in operating speeds were also examined for each speed limit category and were used as additional measures of traffic flow variation.

The results indicated that the standard deviation statistics for each speed limit category were similar (see Table 6). The standard deviations in operating speeds for the 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 km/h before-after speed limit categories were 8.23, 8.21, 9.03, 8.98, 7.23 and 9.16 km/h.

The overall standard deviation in operating speeds for the sample was 8.58 km/h.

2.8/ 85 TH PERCENTILE

The 85 th percentile is the speed below which 85% of the vehicles in the sample were travelling. It is related to the pace and standard deviation

[3]Note: The standard deviation measured the variation about the mean vehicle speed for each site.

since a uniform traffic flow will result in the 85 th percentile being close to the mean.

The 85 th percentiles for the 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 before-after speed limit categories were 108.7, 105.8, 100.1, 94.7, 91.8 and 92.3 km/h respectively (see Table 7). These results showed that the 85 th percentiles were from 7.4 to 10.3 km/h (4.6 to 6.4 mph) above the average speeds for the various speed limit categories (see Table 1) which indicated a somewhat uniform traffic flow for each speed limit category.

2.9/ AADT LEVEL

The AADT is a statistic which refers to the annual average daily traffic volume for a particular highway location. The AADT'S for this sample were divided into the following six categories:HIGH FREEWAY - freeways with AADT's of over 40,000, MEDIUM FREEWAY - freeways with AADT's of 20,000 to 40,000, LOW FREEWAY- freeways with AADT's of under 20,000, HIGH OTHER- non-freeways with AADT's of over 7,000, MEDIUM OTHER- non-freeways with AADT's of 3,000 to 7,000 and LOW OTHER- non-freeways with AADT's of under 3,000.

The site and AADT breakdown for this survey is presented in Table 8. For the purposes of the subsequent analyses, the three freeway AADT categories were combined with the three non-freeway AADT categories in order to obtain three overall AADT categories (High, Medium and Low).

The speed statistics analyzed in sections 2.2 to 2.8 were crosstabulated by AADT level (High, Medium and Low) in order to determine if these statistics varied by traffic volume and, if so, to what degree.

It should be noted that in the following analyses the 90-80 km/h speed limit category was comprised of only two medium volume sites.

2.9.1/ AADT LEVEL BY AVERAGE SPEED

The survey findings indicated that the average speed for the 112-100 km/h speed limit highways was higher for medium and low volume areas (103.0 and 105.1 km/h respectively) in comparison with high volume areas (98.9 km/h). The results also showed that the average speed for medium

volume areas on 80-80 km/h highways was significantly higher (88.9 km/h) than the average speed for high and low volume areas (81.5% and 82.1% respectively) on 80-80 km/h highways.

2.9.2/ AADT LEVEL BY PERCENT COMPLIANT

Table 10 shows that drivers were significantly more likely to be compliant to the posted speed limits on high volume areas of 112-100, 100-100 and 80-80 km/h highways (54.0%, 73.8% and 48.0% respectively) in comparison to medium (39.2%, 64.5% and 17.0% respectively) and low (32.1%, 65.5% and 41.0% respectively) volume areas on these highways. These results were to be expected as the traffic patterns on high density (volume) highways were less favourable to speeding than the traffic patterns on medium and low density highways.

Drivers travelling on the low volume areas of 100-90 km/h and 100-80 km/h highways were much less likely to be compliant than drivers travelling on the medium volume areas of these highways and were also less compliant than drivers travelling on the high volume areas of these highways.

2.9.3/ AADT LEVEL BY PACE AND PERCENT IN PACE

The results showed that the pace was similar for the three AADT levels within most of the before-after speed limit categories (see Table 11).

The percentage of vehicles in the pace did not vary greatly by AADT level for highways with before-after speed limits of 112-100 km/h and 100-80 km/h. However, the findings did indicate that the percentage of vehicles in the pace was more variable by AADT level for highways with 100-100, 100-90 and 80-80 km/h before-after speed limits. This variability was partially attributed to the smaller sample sizes (fewer sites) available for these highways (see Table 11).

2.9.4/ AADT LEVEL BY STANDARD DEVIATION

Table 12 shows that the standard deviations in operating speeds for each AADT level within the various speed limit categories varied somewhat. However, the variations between the high, medium and low AADT levels were all within 3.2 km/h (2.0 mph) for each speed limit category.

2.9.5/ AADT LEVEL BY 85 TH PERCENTILE

The survey showed that very little variation in the 85 th percentile existed between the three AADT levels within each before-after speed limit category (see Table 13). This indicated that the speed below which 85% of the drivers were travelling was not dependent on the AADT level of the various speed limit categories.

2.10/ TYPE OF HIGHWAY

The speed statistics analyzed in sections 2.2 to 2.8 were crosstabulated by type of highway for each speed limit change in order to determine if these statistics varied by highway type and, if so, to what degree.

The following highway types were included in the analyses: freeway, four lane divided, four lane undivided, three lane and two lane. The site and type of highway breakdown for this survey is presented in Table 14.

It should be noted that the 112-100 km/h speed limit category was comprised of only freeway sites and that the 90-80 km/h speed limit category was made up of only 2 lane sites. The remaining speed limit categories were comprised of multiple highway types.

2.10.1/ TYPE OF HIGHWAY BY AVERAGE SPEED

The survey revealed that average speed was not dependent on the type of highway within each speed limit category. Table 15 showed that the greatest variation in average speeds between the various types of highways occurred in the 100-80 km/h before-after speed limit category (6.8 km/h or 4.2 mph). The variations in average speeds by type of highway for the other speed limit categories were even less noticeable (see Table 15).

2.10.2/ TYPE OF HIGHWAY BY PERCENT COMPLIANT

The percentage of drivers who were compliant varied greatly by the type of highway within each speed limit category (see Table 16). The ranges of percent compliancy across the types of highway categories were 64.3% to 71.3%, 39.0% to 47.9%, 30.0% to 55.0% and 37.4% to 63.0% for the 100-100,

100-90, 100-80 and 80-80 km/h speed limit categories respectively. The 112-100 and 90-80 km/h speed limit categories were each comprised of only one type of highway.

The high degree of variability for compliancy by type of highway within most of the speed limit categories can be explained by the fact that of the seventy-nine (79) sites in this survey, 36 were classified as freeways and 37 were classified as 2 lane highways. There were only 2, 3 and 1 sites classified as 4 lane divided, 4 lane undivided and 3 lane respectively (see Table 14).

2.10.3/ TYPE OF HIGHWAY BY PACE AND PERCENT IN PACE

The results indicated that the pace was similar for each type of highway within most of the before-after speed limit categories (see Table 17).

The percentage of vehicles in the pace varied by highway type for the 100-100, 100-90, 100-80 and 80-80 km/h before-after speed limit categories. This variability was attributed in part to the small number of sites available in some speed limit by type of highway categories.

2.10.4/ TYPE OF HIGHWAY BY STANDARD DEVIATION

Table 18 showed that the standard deviations in operating speeds varied slightly for each highway type within most of the speed limit categories. However, the variation was never more than 3.0 km/h (1.9 mph).

2.10.5/ TYPE OF HIGHWAY BY 85 TH PERCENTILE

The speed below which 85% of the drivers were travelling was similar for each highway type within the 100-100, 100-90, 100-80 and 80-80 km/h speed limit categories (see Table 19).

2.11/ AADT LEVEL BY TYPE OF HIGHWAY

A crosstabulation of AADT level by type of highway was presented in Table 20. The results showed that a large percentage of the freeway sites had high traffic volumes while a majority of the two lane sites had medium volumes.

TABLE 1/ AVERAGE SPEED IN OCTOBER 1982 FOR EACH SPEED LIMIT CHANGE (UNWEIGHTED AVERAGES IN PARENTHESES)

SPEED LIMITS (BEFORE-AFTER) KM/H	AVERAGE SPEED KM/H	NUMBER OF SITES	SAMPLE SIZE
112 to 100	100.9 (100.1)	34	3420
100 to 100	97.9 (97.2)	5	500
100 to 90	92.7 (91.1)	11	805
100 to 80	84.4 (86.0)	21	1967
90 to 80	84.8 (84.8)	2	179
80 to 80	83.4 (82.6)	6	499
TOTAL		79	7370

TABLE 2/ HIGHEST RECORDED SPEED (HRS) IN OCTOBER 1982 FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	HRS KM/H	KM/H OVER LIMIT	NUMBER OF SITES	SAMPLE SIZE
112 to 100	121.2	21.2	34	3420
100 to 100	121.4	21.4	5	500
100 to 90	116.4	26.4	11	805
100 to 80	115.1	35.1	21	1967
90 to 80	103.0	23.0	2	179
80 to 80	109.5	29.5	6	499
TOTAL			79	7370

TABLE 3/ LOWEST RECORDED SPEED (LRS) IN OCTOBER 1982 FOR EACH SPEED LIMIT CHANGE

SPEED LIMIT (BEFORE-AFTER) KM/H	LRS KM/H	KM/H UNDER LIMIT	NUMBER OF SITES	SAMPLE SIZE
112 to 100	77.3	22.7	34	3420
100 to 100	77.0	23.0	5	500
100 to 90	69.4	20.6	11	805
100 to 80	64.4	15.6	21	1967
90 to 80	66.0	14.0	2	179
80 to 80	60.7	19.3	6	499
TOTAL			79	7370

TABLE 4/ PERCENT COMPLIANCE WITH SPEED LIMITS IN OCTOBER 1982 FOR EACH SPEED LIMIT CHANGE (IN %)

SPEED LIMITS (BEFORE-AFTER) KM/H	PERCENT COMPLIANT	NUMBER OF SITES	SAMPLE SIZE
112 to 100	49.5	34	3420
100 to 100	68.4	5	500
100 to 90	47.0	11	805
100 to 80	32.0	21	1967
90 to 80	32.5	2	179
80 to 80	41.7	6	499
TOTAL	44.7	79	7370

TABLE 5/ PACE (16 KM/H BAND OF SPEED) AT WHICH THE GREATEST PERCENTAGE OF DRIVERS WERE TRAVELLING AND PERCENT IN PACE FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) (KM/H)	PACE (KM/H)	PERCENT IN PACE	NUMBER OF SITES	SAMPLE SIZE
112 to 100	93-109	72.1	34	3420
100 to 100	90-106	69.1	5	500
100 to 90	85-101	70.0	11	805
100 to 80	77-93	67.3	21	1967
90 to 80	79-95	68.5	2	179
80 to 80	76-92	69.4	6	499
TOTAL		70.1	79	7370

TABLE 6/ STANDARD DEVIATIONS IN OPERATING SPEEDS IN OCTOBER 1982 FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	STANDARD DEVIATION KM/H	NUMBER OF SITES	SAMPLE SIZE
112 to 100	8.23	34	3420
100 to 100	8.21	5	500
100 to 90	9.03	11	805
100 to 80	8.98	21	1967
90 to 80	7.23	2	179
80 to 80	9.16	6	499
TOTAL	8.58	79	7370

TABLE 7/ EIGHTY-FIFTH (85 TH) PERCENTILES IN OCTOBER 1982 FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	85 TH PERCENTILE KM/H	NUMBER OF SITES	SAMPLE SIZE
112 to 100	108.7	34	3420
100 to 100	105.8	5	500
100 to 90	100.1	11	805
100 to 80	94.7	21	1967
90 to 80	91.8	2	179
80 to 80	92.3	6	499
TOTAL		79	7370

TABLE 8/ NUMBER OF SITES AND SAMPLE SIZES BY AADT LEVEL BY SPEED LIMIT CHANGE IN OCTOBER 1982

AADT LEVEL	112-100	100-100	100-90	100-80	90-80	80-80	TOTAL
HIGH FREEWAY (over 40,000)	2615 (26)	--	--	--	--	--	2615 (26)
MEDIUM FREEWAY (20,000-40,000)	300 (3)	100 (1)	--	--	--	--	400 (4)
LOW FREEWAY (under 20,000)	505 (5)	100 (1)	--	--	--	--	605 (6)
HIGH OTHER (over 7,000)	--	200 (2)	100 (1)	506 (5)	--	350 (4)	1156 (12)
MEDIUM OTHER (3,000-7,000)	--	100 (1)	465 (6)	1181 (13)	179 (2)	105 (1)	2030 (23)
LOW OTHER (under 3,000)	--	--	240 (4)	280 (3)	--	44 (1)	564 (8)
TOTAL	3420 (34)	500 (5)	805 (11)	1967 (21)	179 (2)	499 (6)	7370 (79)
HIGH TOTAL	2615 (26)	200 (2)	100 (1)	506 (5)	--	350 (4)	3771 (38)
MEDIUM TOTAL	300 (3)	200 (2)	465 (6)	1181 (13)	179 (2)	105 (1)	2430 (27)
LOW TOTAL	505 (5)	100 (1)	240 (4)	280 (3)	--	144 (1)	1169 (14)

Note: the first number in each category represents the sample size while the number in parentheses ( ) represents the number of sites

TABLE 9/ AVERAGE SPEED (UNWEIGHTED) IN KM/H BY AADT LEVEL BY SPEED LIMIT CHANGE IN OCTOBER 1982

SPEED LIMITS (BEFORE-AFTER) KM/H	AADT LEVEL HIGH	MEDIUM	LOW	TOTAL
112 to 100	98.9	103.0	105.1	100.1
100 to 100	95.5	98.4	98.5	97.2
100 to 90	94.0	90.3	93.1	91.1
100 to 80	85.2	85.2	89.5	86.0
90 to 80	--	84.8	--	84.8
80 to 80	81.5	88.9	82.1	82.6

TABLE 10/ PERCENT COMPLIANT BY AADT LEVEL BY SPEED LIMIT CHANGE IN OCTOBER 1982

SPEED LIMITS (BEFORE-AFTER) KM/H	AADT LEVEL HIGH	MEDIUM	LOW	TOTAL
112 to 100	54.0	39.2	32.1	49.5
100 to 100	73.8	64.5	65.5	68.4
100 to 90	39.0	55.0	37.1	47.0
100 to 80	33.2	33.8	22.0	32.0
90 to 80	--	32.5	--	32.5
80 to 80	48.0	17.0	41.0	41.7
TOTAL	51.3	40.7	34.4	44.7

Note: refer to Table 8 for sample size and number of sites breakdowns for the categories

TABLE 11/ PACE AT WHICH THE GREATEST PERCENTAGE OF DRIVERS WERE TRAVELLING (KM/H) AND PERCENT IN PACE IN OCTOBER 1982 BY AADT LEVEL FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	AADT LEVEL HIGH	MEDIUM	LOW	TOTAL
112 to 100	92-108	97-113	98-114	93-109
	72.2%	75.0%	70.3%	72.1%
100 to 100	89-105	92-108	92-108	90-106
	62.3%	71.8%	77.5%	69.1%
100 to 90	89-105	84-100	87-103	85-101
	76.5%	70.5%	67.6%	70.0%
100 to 80	79-95	77-93	82-98	77-93
	68.9%	66.3%	69.2%	67.3%
90 to 80	--	79-95	--	79-95
		68.5%		68.5%
80 to 80	74-90	85-101	77-93	76-92
	71.8%	65.0%	64.5%	69.4%

Note: the first entry in each category represents the pace range (KM/H) while the second entry represents the percentage of vehicles in that pace range

Note: refer to Table 8 for sample size and number of sites breakdowns for the categories

TABLE 12/ STANDARD DEVIATIONS IN OPERATING SPEEDS (KM/H) BY AADT LEVEL IN OCTOBER 1982 BY SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	AADT LEVEL HIGH	MEDIUM	LOW	TOTAL
112 to 100	8.26	6.92	8.89	8.23
100 to 100	9.53	7.45	7.07	8.21
100 to 90	6.31	9.13	9.56	9.03
100 to 80	9.26	8.69	9.74	8.98
90 to 80	--	7.23	--	7.23
80 to 80	9.02	9.27	9.63	9.16
TOTAL	8.48	8.42	9.19	8.58

TABLE 13/ EIGHTY-FIFTH (85 TH) PERCENTILES IN KM/H FOR EACH SPEED LIMIT CHANGE BY AADT LEVEL IN OCTOBER 1982

SPEED LIMITS (BEFORE-AFTER) KM/H	AADT LEVEL HIGH	MEDIUM	LOW	TOTAL
112 to 100	107.2	110.6	114.5	108.7
100 to 100	104.7	107.1	105.5	105.8
100 to 90	101.4	99.3	101.3	100.1
100 to 80	93.7	93.9	99.8	94.7
90 to 80	--	91.8	--	91.8
80 to 80	90.0	99.8	93.4	92.3

Note: refer to Table 8 for sample size and number of sites breakdowns for the categories

TABLE 14/ NUMBER OF SITES AND SAMPLE SIZES BY TYPE OF HIGHWAY IN OCTOBER 1982 BY SPEED LIMIT CHANGE

TYPE OF HIGHWAY	112 to 100	100 to 100	100 to 90	100 to 80	90 to 80	80 to 80	TOTAL
FREEWAY	3420 (34)	200 (2)	--	--	--	--	3620 (36)
FOUR LANE DIVIDED	--	100 (1)	--	--	--	100 (1)	200 (2)
FOUR LANE UNDIVIDED	--	--	100 (1)	101 (1)	--	100 (1)	301 (3)
THREE LANE	--	--	--	76 (1)	--	--	76 (1)
TWO LANE	--	200 (2)	705 (10)	1790 (19)	179 (2)	299 (4)	3173 (37)
TOTAL	3420 (34)	500 (5)	805 (11)	1967 (21)	179 (2)	499 (6)	7370 (79)

Note: the first number in each category represents the sample size while the number in parentheses( ) represents the number of sites

TABLE 15/ AVERAGE SPEED (UNWEIGHTED) IN KM/H IN OCTOBER 1982 BY TYPE OF HIGHWAY BY SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	FREEWAY	4 LANE DIVIDED	4 LANE NOT DIVIDED	3 LANE	2 LANE	TOTAL
112 to 100	100.1	--	--	--	--	100.1
100 to 100	98.2	97.2	--	--	96.3	97.2
100 to 90	--	--	94.0	--	91.1	91.1
100 to 80	--	--	79.7	85.8	86.5	86.0
90 to 80	--	--	--	--	84.8	84.8
80 to 80	--	78.4	82.8	--	83.9	82.6

TABLE 16/ PERCENT COMPLIANT BY TYPE OF HIGHWAY IN OCTOBER 1982 BY SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	FREEWAY	4 LANE DIVIDED	4 LANE NOT DIVIDED	3 LANE	2 LANE	TOTAL
112 to 100	49.5	--	--	--	--	49.5
100 to 100	64.3	71.0	--	--	71.3	68.4
100 to 90	--	--	39.0	--	47.9	47.0
100 to 80	--	--	55.0	30.0	30.9	32.0
90 to 80	--	--	--	--	32.5	32.5
80 to 80	--	63.0	37.5	--	37.4	41.7
TOTAL	50.3	67.0	43.8	30.0	38.4	44.7

Note: refer to Table 14 for sample size and number of sites breakdowns for the categories

TABLE 17/ PACE AT WHICH THE GREATEST PERCENTAGE OF DRIVERS WERE TRAVELLING AND PERCENT IN PACE IN OCTOBER 1982 FOR EACH SPEED LIMIT CATEGORY BY TYPE OF HIGHWAY

SPEED LIMITS (BEFORE-AFTER) KM/H	FREEWAY	4 LANE DIVIDED	4 LANE NOT DIVIDED	3 LANE	2 LANE	TOTAL
112 to 100	93-109	--	--	--	--	93-109
	72.1					72.1
100 to 100	92-108	87-103	--	--	92-108	90-106
	72.0	60.5			70.5	69.1
100 to 90	--	--	89-105	--	85-101	85-101
			76.5		69.4	70.0
100 to 80	--	--	72-88	77-93	79-95	77-93
			63.0	51.0	68.4	67.3
90 to 80	--	--	--	--	79-95	79-95
					68.5	68.5
80 to 80	--	69-85	76-92	--	79-95	76-92
		63.0	70.5		70.8	69.4

Note: the first entry in each category represents the pace range while the second entry represents the percentage of vehicles in that pace range

Note: the pace range was measured in KM/H

Note: refer to Table 14 for sample size and number of sites breakdowns for the categories

TABLE 18/ STANDARD DEVIATIONS IN OPERATING SPEEDS (KM/H) IN OCTOBER 1982 BY TYPE OF HIGHWAY BY SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	FREEWAY	4 LANE DIVIDED	4 LANE NOT DIVIDED	3 LANE	2 LANE	TOTAL
112 to 100	8.23	--	--	--	--	8.23
100 to 100	7.65	9.85	--	--	7.94	8.21
100 to 90	--	--	6.31	--	9.31	9.03
100 to 80	--	--	8.32	8.69	9.03	8.98
90 to 80	--	--	--	--	7.22	7.22
80 to 80	--	9.24	8.32	--	9.34	9.16
TOTAL	8.19	9.55	7.65	8.69	8.98	8.58

TABLE 19/ EIGHTY-FIFTH (85 TH) PERCENTILES IN KM/H FOR EACH SPEED LIMIT CHANGE BY TYPE OF HIGHWAY IN OCTOBER 1982

SPEED LIMITS (BEFORE-AFTER)	FREEWAY	4 LANE DIVIDED	4 LANE NOT DIVIDED	3 LANE	2 LANE	TOTAL
112 to 100	108.7	--	--	--	--	108.7
100 to 100	106.7	107.9	--	--	103.8	105.8
100 to 90	--	--	101.4	--	100.1	100.1
100 to 80	--	--	89.4	93.4	95.2	94.7
90 to 80	--	--	--	--	91.8	91.8
80 to 80	--	88.6	--	--	93.2	92.3

Note: refer to Table 14 for sample size and number of sites breakdowns for the categories

TABLE 20/ AADT LEVEL BY TYPE OF HIGHWAY IN OCTOBER 1982

AADT LEVEL	FREEWAY	4 LANE DIVIDED	4 LANE NOT DIVIDED	3 LANE	2 LANE	TOTAL
HIGH FREEWAY	2615 (26)	—	--	--	--	2615 (26)
MEDIUM FREEWAY	400 (4)	--	--	--	--	400 (4)
LOW FREEWAY	605 (6)	--	--	--	--	605 (6)
HIGH OTHER	--	200 (2)	200 (2)	--	756 (8)	1156 (12)
MEDIUM OTHER	--	--	101 (1)	76 (1)	1853 (21)	2030 (23)
LOW OTHER	--	--	--	--	564 (8)	564 (8)
TOTAL	3620 (36)	200 (2)	301 (3)	76 (1)	3173 (37)	7370 (79)

Note: the first number in each category is the sample size and the number in parentheses ( ) is the number of sites

3/ COMPARISONS OF OCTOBER 1982 AND MAY 1977 SPEED STATISTICS

3.1/ COMPARISON OUTLINE

The following sections are concerned primarily with comparing October 1982 speed statistics with May 1977 speed statistics in order to determine if driving patterns have changed on the highways of Ontario in the past five to six years and, if so, to what degree. The speed statistics from the before legislation period (circa 1975) were included in the tables for this section in order to give the reader a before-after perspective.

The October 1982 and May 1977 surveys were compared by the following variables: average speed, highest recorded speed (HRS), lowest recorded speed (LRS), percent compliant, pace, percent in pace, standard deviation and 85 th percentile. The percent compliant, pace, percent in pace and 85 th percentile statistics were also crosstabulated by AADT level and type of highway for the surveys.

The comparisons of the October 1982 and May 1977 surveys utilized data from forty-two (42) sites (N=3768). These 42 sites had speed statistics available from each of the three surveys (October 1982, May 1977 and Before legislation). A total of 37 sites were not selected for the comparison section of the report because period data was not available for at least one of the survey periods.

3.2/ AVERAGE SPEED

The average speed for most of the speed limit categories increased from May 1977[4] to October 1982 (see Table 21). The average speeds in this five to six year period increased by 3.7 km/h (101.1 to 104.8 km/h), 3.0 km/h (95.2 to 98.2 km/h), 2.9 km/h (83.6 to 86.5 km/h) and 1.7 km/h (81.1 to 82.8 km/h) for the 112-100, 100-100, 100-80 and 80-80 km/h before-after speed limit categories respectively. Average speeds were unchanged (90.5 to 90.5 km/h) for the 100-90 km/h speed limit category and decreased by 5.7 km/h (90.5 to 84.8 km/h) for the 90-80 km/h speed limit category. It should be noted that the decrease in average speed

[4] Note: May 1977 average speed data was not available for the 42 sites. Thus, it was necessary to utilize available data from the next closest period in time, October 1978. It should be noted that October 1978 data was very similar to May 1977 data for the other speed statistics.

for the 90-80 speed limit category was based on only two (2) sites (see Table 21).

3.3/ HIGHEST RECORDED SPEED (HRS)

Table 22 indicated that the average highest recorded speeds (HRS) decreased from May 1977 to October 1982 for four of the six speed limit categories. The greatest decrease in HRS occurred for the 90-80 km/h speed limit category (a drop of 14.5 km/h). The HRS decreased less significantly for the 100-90, 100-100 and 100-80 km/h speed limit categories (5.3, 4.1 and 1.0 km/h respectively). The average HRS increased by 5.7 km/h and 1.3 km/h for the 80-80 km/h and 112-100 km/h speed limit categories respectively. These results showed that, in general, there were still a certain percentage of drivers who were speeding and that their degree of speeding had not changed significantly in most cases.

3.4/ LOWEST RECORDED SPEED (LRS)

The average lowest recorded speeds (LRS) increased from May 1977 to October 1982 for the 100-100 km/h speed limit category (up 8.9 km/h) and remained similar for the other five speed limit categories (see Table 23)

3.5/ PERCENT COMPLIANT

The results indicated that the percentage of drivers who were compliant increased significantly from October 1982 to May 1977 for the 100-100 and 100-90 km/h speed limit categories (50.5% to 64.3% and 45.4% to 51.9% respectively) and decreased significantly for the 100-80, 90-80 and 80-80 km/h speed limit categories (39.5% to 29.2%, 42.0% to 32.5% and 64.3% to 41.7% respectively). Compliancy remained relatively unchanged (33.5% to 31.3%) for the 112-100 km/h speed limit category (see Table 24).

Overall compliancy decreased by 6.9% (43.8% to 36.9%) from May 1977 to October 1982 which indicated that fewer drivers on average were adhering to the posted speed limits.

The results also showed that increases in the average speeds for the 112-100, 100-80 and 80-80 km/h speed limit categories (see Table 21) paralleled decreases in compliancy for these categories (see Table 24). This pattern was not evident for the other speed limit categories.

3.6/ PACE AND PERCENT IN THE PACE

The pace range increased by 1 to 4 km/h for four of the six speed limit categories and remained the same for the other two categories.

The pace ranges in May 1977 for the 112-100, 100-100, 90-80 and 80-80 km/h speed limit categories were 95-111, 89-105, 77-93 and 72-88 km/h respectively (see Table 25). These pace ranges increased to 98-114, 92-108, 79-95 and 76-92 km/h respectively in October 1982. The pace remained the same at 84-100 km/h and 79-95 km/h for the 100-90 and 100-80 km/h speed limit categories.

The percentage of vehicles in the pace increased significantly from May 1977 to October 1982 for the 90-80 km/h speed limit category (+9.0 km/h) and remained relatively unchanged for the other speed limit categories (see Table 25).

The overall percentage in the pace for the sample decreased by 0.8% which indicated that, in general, the traffic flow on the highways of Ontario had not changed.

3.7/ 85 TH PERCENTILE

The 85 th percentile increased by 3.6, 2.0, 0.3, 0.8 and 4.5 km/h for the 112-100, 100-100, 100-90, 100-80 and 80-80 km/h speed limit categories. The 85 th percentile for the 90-80 km/h speed limit category decreased by 3.2 km/h (see Table 26).

3.8/ STANDARD DEVIATION

Table 27 showed that the standard deviations in operating speeds decreased from May 1977 to October 1982 for five of the six speed limit categories.

The standard deviations in operating speeds decreased by 0.69, 1.85, 2.19, 2.75 and 1.68 km/h for the 112-100, 100-100, 100-80, 90-80 and 80-80 km/h speed limit categories. In comparison, the standard deviations in operating speeds increased by 0.15 km/h for the 100-90 km/h speed limit category.

These results suggest that less variability about the mean speed existed in the October 1982 data in comparison to the May 1977 data.

3.9/ AADT LEVEL

A breakdown of AADT level by speed limit category is presented in Table 28 for the survey periods. The crosstabulation indicated that the breakdown of AADT levels has changed from May 1977 to October 1982 for the 42 sites involved in the comparisons.

The high-medium-low AADT breakdown in May 1977 for the 42 sites was 9-15-18 while the breakdown in October 1982 was 8-24-10. These figures indicated that from May 1977 to October 1982, the traffic volume at one (1) site decreased from high to medium while the traffic volumes at eight sites increased from low to medium.

The percent compliant, pace, percent in pace and 85 th percentile statistics for the 42 sites involved in the comparisons were crosstabulated by AADT level in order to obtain a more detailed insight into the changes, if any, that developed in the speed statistics from May 1977 to October 1982.

3.9.1/ AADT LEVEL BY PERCENT COMPLIANT

The findings showed that the percentage of drivers who were compliant to the posted speed limits decreased significantly from May 1977 to October 1982 for the high volume areas within 100-80 and 80-80 km/h speed limit categories (see Table 29).

Drivers who were travelling on the medium volume areas of 100-80, 90-80 and 80-80 km/h highways were significantly less compliant in October 1982 than in May 1977. The survey also showed that compliancy was higher on the medium volume areas of 112-100 and 100-90 km/h highways (see Table 29).

Compliancy decreased on the low volume areas of 112-100, 100-90, 100-80 and 80-80 km/h highways from May 1977 to October 1982 and increased on the low volume areas of 100-100 km/h highways.

Overall results for the sample indicated that compliancy decreased by 9.5%, 10.5% and 6.4% from May 1977 to October 1982 for the high (44.4% to 34.9%), medium (50.3% to 39.8%) and low (38.1% to 31.7%) volume areas of Ontario highways (see Table 29).

3.9.2/ AADT LEVEL BY PACE AND PERCENT IN PACE

The pace range either remained the same or increased by 3 km/h (2 mph) or less from May 1977 to October 1978 for most of the AADT levels within the various speed limit categories (see Table 30). There were only three AADT by speed limit categories where the pace range increased by 5 km/h or more. These categories were: the low volume areas of 100-80 km/h highways (+ 5km/h), the medium volume areas of 90-80 km/h highways (+ 5km/h) and the medium volume areas of 80-80 km/h highways (+ 14 km/h). The rather large increase in pace range for the medium volume areas of 80-80 km/h highways was partly attributed to the traffic volume increases from May 1977 to October 1982 which reclassified one of the two sites in this category (see Table 28).

The comparisons of May 1977 and October 1982 percent in pace by AADT level categories for the various speed limit groups indicated that the percentage of vehicles in the pace increased for most low volume areas, decreased for most medium volume areas and all high volume areas (see Table 30).

3.9.3/ AADT LEVEL BY 85 TH PERCENTILE

The speed below which 85% of the drivers were travelling (85 th percentile) increased slightly from May 1977 to October 1982 for the low and medium volume areas of freeways (112-100 and 100-100 km/h highways).

The findings also showed that the 85 th percentiles for the AADT levels (low, medium and high) within the 100-90, 100-80, 90-80 and 80-80 km/h speed limit categories either remained relatively the same ($\pm$ 3 km/h) or increased by 5.5 to 11.2 km/h (see Table 31).

3.10/ TYPE OF HIGHWAY

A breakdown of type of highway by speed limit category for the survey periods is presented in Table 32. It should be noted that none of the highways involved in the comparisons had been reclassified. That is, the freeway, 4 lane divided, 4 lane undivided, 3 lane and 2 lane distribution of highway type (8, 1, 2, 1 and 30 respectively) in May 1977 was the same in October 1982.

The percent compliant, pace, percent in pace and 85 th percentile statistics for the 42 sites involved in the comparisons were crosstabulated by type of highway in order to determine if any of the changes in speed statistics were dependent on highway type.

3.10.1/ TYPE OF HIGHWAY BY PERCENT COMPLIANT

The compliancy rates of drivers travelling on 100-100 km/h freeways increased significantly from May 1977 to October 1982 (50.5% to 6[illegible] 3%) and decreased slightly for drivers travelling on 112-100 km/h freeways (33.5% to 31.3%).

Drivers travelling on 100-80, 90-80 and 80-80 km/h 2 lane highways (see Table 33) were significantly less compliant in October 1982 (27.6%, 32.5% and 37.4% respectively) than in May 1977 (38.9%, 42.5% and 54.5% respectively). The compliancy rates of drivers travelling on 100-90 km/h 2 lane highways increased from May 1977 to October 1982 (45.4% to 51.9%).

Table 33 showed that compliancy decreased significantly from May 1977 to October 1982 for the one (1) 80-80 km/h 4 lane divided highway site in the survey (92.0% to 63.0%) and decreased for the one (1) 100-80 km/h 3 lane highway site in the survey (36.0% to 30.0%).

There were two 4 lane undivided highway sites in the sample (see Table 33) and driver compliancy decreased significantly from May 1977 to October 1982 at the 80-80 km/h site (76.0% to 37.5%) and increased slightly at the 100-80 km/h site (52.5% to 55.0%).

Overall results for the sample indicated that the compliancy rates of drivers travelling on freeways increased slightly from May 1977 to October 1982 (37.8% to 39.6%) and decreased significantly for drivers travelling on 2 lane (42.8% to 34.9%), 3 lane (36.0% to 30.0%), 4 lane undivided (64.3% to 46.3%) and 4 lane divided (92.0% to 63.0%) highways.

3.10.2/ TYPE OF HIGHWAY BY PACE AND PERCENT IN PACE

The pace range at which the greatest percentage of drivers were travelling either remained the same or increased slightly (1.2 to 3.0 km/h) from May 1977 to October 1982 for most of the highway type by speed limit categories (see Table 34).

The percentage of drivers in the pace was similar in May 1977 and October 1982 for drivers travelling on 112-100 (72.4% to 71.2%) and 100-100 (71.0% to 72.0%) km/h freeways.

The results also showed that the percentage of vehicles in the pace increased by 9.0% from May 1977 to October 1982 for 90-80 km/h 2 lane highways and remained relatively unchanged ($\pm$ 3.4%) for 100-90, 100-80 and 80-80 km/h 2 lane highways (see Table 34).

The percentage of vehicles in the pace decreased significantly from May 1977 to October 1982 for the one (1) 3 lane highway site in the survey (97.0% to 51.0%) and the one (1) 4 lane divided highway site in the survey (83.0% to 63.0%). Meanwhile, the percentage of vehicles in the pace did not change significantly from May 1977 to October 1982 for the two 4 lane undivided sites in the sample (64.5% to 63.0% for the 100-80 km/h site and 65.0% to 70.5% for the 80-80 km/h site)/

These results showed that the percentage of drivers in the pace remained relatively unchanged for freeways from May 1977 to October 1982 and varied (increased or decreased) for other highway types (see Table 34).

3.10.3/ TYPE OF HIGHWAY BY 85 TH PERCENTILE

The results showed that the speed below which 85% of the drivers were travelling remained relatively the same ($\pm$3.6 km/h) from May 1977 to October 1982 for most of the highway type by speed limit categories (see Table 35). The only exceptions were the 80-80 km/h 4 lane divided and 4 lane undivided categories where the 85 th percentiles increased by 11.3 km/h and 5.7 km/h respectively from May 1977 to October 1982.

TABLE 21/ AVERAGE SPEED (UNWEIGHTED IN KM/H) IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 (42 sites)	MAY * 1977 (42 sites)	BEFORE ** LEGISLATION (62 sites)
112 to 100	104.8 (6) N=605	101.1 (6) N=600	113.5
100 to 100	98.2 (2) N=200	95.2 (2) N=200	93.4
100 to 90	90.5 (7) N=498	90.5 (7) N=565	94.7
100 to 80	86.5 (19) N=1787	83.6 (19) N=1823	91.6
90 to 80	84.8 (2) N=179	90.5 (2) N=200	88.1
80 to 80	82.8 (6) N=499	81.1 (6) N=566	83.6
TOTAL	N=3768	N=3954	

* Note: May 1977 average speed data was not available in raw form and thus it was impossible to generate a May 1977 average for the 42 sites selected for the comparisons. Data was used from the next closest period in time (October 1978)

** Note: Before legislation (circa 1975) average speed data was not available in raw form and thus it was impossible to generate a Before period average for the 42 sites selected for the comparisons. Data was used from the overall Before legislation sample (62 sites)

Note: The number in parentheses for each table category represents the number of sites while N represents the sample size for each category

TABLE 22/ HIGHEST RECORDED SPEED (HRS) IN KM/H IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER)	OCTOBER 1982	MAY 1977	BEFORE LEGISLATION
112 to 100	128.8 (6) N=605	127.5 (6) N=605	136.4 (6) N=605
100 to 100	119.9 (2) N=200	124.0 (2) N=200	119.1 (2) N=200
100 to 90	113.8 (7) N=498	119.1 (7) N=498	124.6 (7) N=498
100 to 80	116.2 (19) N=1787	117.2 (19) N=1787	125.3 (19) N=1787
90 to 80	103.0 (2) N=179	117.5 (2) N=179	115.9 (2) N=179
80 to 80	109.5 (6) N=499	103.8 (6) N=499	119.1 (6) N=499
TOTAL	(42) N=3768	(42) N=3768	(42) N=3768

Note: the number in parentheses ( ) in each category represents the number of sites while N represents the sample size

TABLE 23/ LOWEST RECORDED SPEED (LRS) IN KM/H IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982	MAY 1977	BEFORE LEGISLATION
112 to 100	84.0	81.3	80.5
100 to 100	78.9	70.0	62.0
100 to 90	67.6	70.7	65.5
100 to 80	64.9	64.6	69.2
90 to 80	66.0	66.0	71.6
80 to 80	60.7	64.9	63.9

TABLE 24/ PERCENT COMPLIANCE WITH SPEED LIMITS IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982	MAY 1977	BEFORE LEGISLATION
112 to 100	31.3	33.5	53.2
100 to 100	64.3	50.5	73.3
100 to 90	51.9	45.4	63.5
100 to 80	29.2	39.5	67.7
90 to 80	32.5	42.0	59.5
80 to 80	41.7	64.3	31.0
TOTAL	36.9	43.8	59.5

Note: refer to Table 22 for sample size and number of sites breakdowns for the categories

TABLE 25/ PACE AND PERCENT IN PACE IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982	MAY 1977	BEFORE LEGISLATION
112 to 100	98-114 71.1%	95-111 72.4%	106-122 57.9%
100 to 100	92-108 72.0%	89-105 71.0%	87-103 63.0%
100 to 90	84-100 69.8%	84-100 66.4%	89-105 59.9%
100 to 80	79-95 67.1%	79-95 69.1%	85-101 60.8%
90 to 80	79-95 68.5%	77-93 59.5%	81-97 66.0%
80 to 80	76-92 69.4%	72-88 73.9%	81-97 64.3%
TOTAL	68.7%	69.5%	61.1%

Note: the first entry in each category represents the pace (KM/H) while the second entry represents the percent compliance

TABLE 26/ EIGHTY-FIFTH (85 TH) PERCENTILES FOR EACH SPEED LIMIT CHANGE IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975)

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 KM/H	MAY 1977 KM/H	BEFORE LEGISLATION KM/H
112 to 100	114.0	110.4	122.8
100 to 100	106.7	104.7	100.6
100 to 90	99.2	98.9	105.3
100 to 80	95.3	94.5	102.9
90 to 80	91.8	95.0	98.2
80 to 80	92.3	87.8	98.4

Note: refer to Table 22 for sample size and number of sites breakdowns for the categories

TABLE 27/ STANDARD DEVIATIONS IN OPERATING SPEEDS (KM/H) IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975)

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982	MAY * 1977	BEFORE * LEGISLATION
112 to 100	8.36	9.05	12.35
100 to 100	7.65	9.50	11.77
100 to 90	9.50	9.35	12.33
100 to 80	9.03	11.22	13.51
90 to 80	7.23	9.98	9.98
80 to 80	9.16	10.84	13.51

* Note: May 1977 and Before legislation (circa 1975) average speed data were not available in raw form and thus it was impossible to generate period averages for the 42 sites selected for the comparisons. Data was used from the overall May 1977 and Before legislation samples (62 sites)

TABLE 28/ AADT LEVEL IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) BY SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 HIGH	MEDIUM	LOW	TOTAL	MAY 1977 HIGH	MEDIUM	LOW	TOTAL	BEFORE LEGISLATION HIGH	MEDIUM	LOW	TOTAL
112 to 100	--	200 (2)	405 (4)	605 (6)	--	205 (2)	400 (4)	605 (6)	--	200 (2)	405 (4)	605 (6)
100 to 100	--	100 (1)	100 (1)	200 (2)	--	--	200 (2)	200 (2)	--	--	200 (2)	200 (2)
100 to 90	--	364 (5)	134 (2)	400 (7)	--	250 (3)	248 (4)	498 (7)	--	250 (3)	248 (4)	498 (7)
100 to 80	406 (4)	1181 (13)	200 (2)	1787 (19)	607 (6)	680 (7)	500 (6)	1787 (19)	607 (6)	680 (7)	500 (6)	1787 (19)
90 to 80	--	179 (2)	--	179 (2)	--	100 (1)	79 (1)	179 (2)	--	100 (1)	79 (1)	179 (2)
80 to 80	350 (4)	105 (1)	44 (1)	499 (6)	250 (3)	205 (2)	44 (1)	499 (6)	250 (3)	205 (2)	44 (1)	499 (6)
TOTAL	756 (8)	2129 (24)	883 (10)	3768 (42)	857 (9)	1440 (15)	1471 (18)	3768 (42)	857 (9)	1440 (15)	1471 (18)	3768 (42)

Note: the first entry in each category represents the sample size of that category while the second entry in parentheses ( ) represents the number of sites for that category

TABLE 29/ AADT LEVEL BY PERCENT COMPLIANT IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 HIGH	MEDIUM	LOW	TOTAL	MAY 1977 HIGH	MEDIUM	LOW	TOTAL	BEFORE LEGISLATION HIGH	MEDIUM	LOW	TOTAL
112 to 100	--	38.0	28.0	31.3	--	34.5	33.0	33.5	--	87.5	36.0	53.2
100 to 100	--	63.0	65.5	64.3	--	--	50.5	50.5	--	--	73.3	73.3
100 to 90	--	58.7	35.0	51.9	--	55.0	38.1	45.4	--	78.2	52.5	63.5
100 to 80	21.8	33.8	14.0	29.2	34.7	49.7	32.4	39.5	66.4	70.7	65.3	67.7
90 to 80	--	32.5	--	32.5	--	49.0	36.0	42.0	--	79.0	40.0	59.5
80 to 80	48.0	17.0	41.0	41.7	64.0	62.0	70.0	64.3	40.7	14.8	34.5	31.0
TOTAL	34.9	39.8	31.7	36.9	44.4	50.3	38.1	43.8	57.8	67.5	53.7	59.5

Note: refer to Table 28 for sample size and number of sites breakdowns for the categories

TABLE 30/ AADT LEVEL BY PACE AND PERCENT IN PACE IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/h	OCTOBER 1982 HIGH	MEDIUM	LOW	TOTAL	MAY 1977 HIGH	MEDIUM	LOW	TOTAL	BEFORE LEGISLATION HIGH	MEDIUM	LOW	TOTAL
112 to 100		97-113	98-114	98-114	--	97-113	95-111	95-111	--	97-113	95-111	106-122
		74.5	69.4	71.1		75.3	71.0	72.4		56.5	58.6	57.9
100 to 100	--	90-106	92-108	92-108	--	--	89-105	89-105	--	--	87-103	87-103
		66.5	77.5	72.0			71.0	71.0			63.0	63.0
100 to 90	--	82-98	87-103	84-100	--	82-98	85-101	84-100	--	84-100	92-108	89-105
		71.2	66.3	69.8		77.8	57.9	66.4		62.0	58.3	59.9
100 to 80	81-97	77-93	84-100	79-95	81-97	76-92	79-95	79-95	87-103	85-101	85-101	85-101
	70.4	66.3	65.8	67.1	72.5	72.1	62.3	69.1	61.3	62.9	57.8	60.8
90 to 80	--	79-95	--	79-95	--	74-90	81-97	77-93	--	84-100	77-93	81-97
		68.5		68.5		64.0	55.0	59.5		69.0	63.0	66.0
80 to 80	74-90	85-101	77-93	76-92	71-87	71-87	77-93	73-89	79-95	85-101	81-97	81-97
	71.8	65.0	64.5	69.4	81.0	70.5	59.5	73.9	66.7	61.8	62.0	64.3

Note: refer to Table 28 for sample size and number of sites breakdowns for the categories

Note: the first entry in each category represents the pace range while the second entry represents the percentage of vehicles in that pace range

TABLE 31/ AADT LEVEL BY 85 TH PERCENTILE (KM/H) IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 HIGH	MEDIUM	LOW	TOTAL	MAY 1977 HIGH	MEDIUM	LOW	TOTAL	BEFORE LEGISLATION HIGH	MEDIUM	LOW	TOTAL
112 to 100	--	110.8	115.8	114.0	--	109.2	111.1	110.4	--	113.5	127.7	122.8
100-100	--	107.9	104.7	106.7	--	104.7	--	104.7	--	--	100.6	100.6
100-90	--	98.4	101.4	99.2	--	94.7	101.9	98.9	--	99.8	109.5	105.3
100-80	96.3	90.6	103.0	95.3	95.6	91.8	96.3	94.5	103.5	100.0	105.3	102.9
90-80	--	91.8	--	91.8	--	95.0	95.0	95.0	--	99.8	96.6	98.2
80-80	90.0	99.8	93.4	92.3	84.5	88.6	95.0	87.6	93.7	104.7	99.8	98.4

Note: refer to Table 28 for sample size and number of sites breakdowns for the categories

TABLE 32/ TYPE OF HIGHWAY IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE	MAY 1977 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE
112 to 100	605 (6)	--	--	--	--	605 (6)	--	--	--	--
100 to 100	200 (2)	--	--	--	--	200 (2)	--	--	--	--
100 to 90	--	--	--	--	498 (7)	--	--	--	--	498 (7)
100 to 80	--	--	101 (1)	76 (1)	1610 (17)	--	--	101 (1)	76 (1)	1610 (17)
90 to 80	--	--	--	--	179 (2)	--	--	--	--	179 (2)
80 to 80	--	100 (1)	100 (1)	--	299 (4)	--	100 (1)	100 (1)	--	299 (4)
TOTAL	805 (8)	100 (1)	201 (2)	76 (1)	2586 (30)	805 (8)	100 (1)	201 (2)	76 (1)	2586 (30)

Note: the first entry in each category represents the sample size of that category while the second entry in parentheses ( ) represents the number of sites for that category

TABLE 32/ CONTINUED

SPEED LIMITS (BEFORE-AFTER) KM/H	BEFORE LEGISLATION (circa 1975) FREEWAY	4 LANE DIVIDED	4 LANE UNDIVIDED	3 LANE	2 LANE
112 to 100	605 (6)	--	--	--	--
100 to 100	200 (2)	--	--	--	--
100 to 90	--	--	--	--	498 (7)
100 to 80	--	--	101 (1)	76 (1)	1610 (17)
90 to 80	--	--	--	--	179 (2)
80 to 80	--	100 (1)	100 (1)	--	299 (4)
TOTAL	805 (8)	100 (1)	201 (2)	76 (1)	2586 (30)

Note: the first entry in each category represents the sample size of that category while the second entry in parentheses ( ) represents the number of sites for that category

TABLE 33/ TYPE OF HIGHWAY BY PERCENT COMPLIANT IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE	MAY 1977 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE
112 to 100	31.3	--	--	--	--	33.5	--	--	--	--
100 to 100	64.3	--	--	--	--	50.5	--	--	--	--
100 to 90	--	--	--	--	51.9	--	--	--	--	45.4
100 to 80	--	--	55.0	30.0	27.6	--	--	52.5	36.0	38.9
90 to 80	--	--	--	--	32.5	--	--	--	--	42.5
80 to 80	--	63.0	37.5	--	37.4	--	92.0	76.0	--	54.5
TOTAL	39.6	63.0	46.3	30.0	34.9	37.8	92.0	64.3	36.0	42.8

Note: refer to Table 32 for sample size and number of sites breakdowns for the categories

TABLE 33/ CONTINUED

SPEED LIMITS (BEFORE-AFTER) KM/H	BEFORE LEGISLATION (circa 1975) FREEWAY	4 LANE DIVIDED	4 LANE UNDIVIDED	3 LANE	2 LANE
112 to 100	53.2	--	--	--	--
100 to 100	73.3	--	--	--	--
100 to 90	--	--	--	--	63.5
100 to 80	--	--	93.5	80.0	65.4
90 to 80	--	--	--	--	59.5
80 to 80	--	78.0	8.0	--	25.0
TOTAL	58.2	78.0	50.8	80.0	59.2

Note: refer to Table 32 for sample size and number of sites breakdowns for the categories

TABLE 34/ TYPE OF HIGHWAY BY PACE AND PERCENT IN PACE IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE AFTER) KM/H	OCTOBER 1982 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE	MAY 1977 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE
112 to 100	98-114 71.1	--	--	--	--	95-111 72.4	--	--	--	--
100 to 100	92-108 72.0	--	--	--	--	89-105 71.0	--	--	--	--
100 to 90	--	--	--	--	84-100 69.8	--	--	--	--	84-100 66.4
100 to 80	--	--	73-89 63.0	77-93 51.0	79-95 68.3	--	--	73-89 64.5	81-97 97.0	79-95 67.8
90 to 80	--	--	--	--	79-95 68.5	--	--	--	--	77-93 59.5
80 to 80	--	69-85 63.0	76-92 70.5	--	79-95 70.5	--	63-79 83.0	69-85 65.0	--	76-92 73.9

Note: refer to Table 32 for sample size and number of site breakdowns for the categories

Note: the first entry in each category represents the pace range while the second entry represents the percentage of vehicles in that pace range

TABLE 34/ CONTINUED

SPEED LIMITS (BEFORE-AFTER) KM/H	BEFORE LEGISLATION (circa 1975) FREEWAY	4 LANE DIVIDED	4 LANE UNDIVIDED	3 LANE	2 LANE
112 to 100	106-122 57.9	--	--	--	--
100 to 100 63.0	87-103 63.0	--	--	--	--
100 to 90	--	--	--	--	89-105 59.8
100 to 80	--	--	77-93 66.5	87-103 72.0	87-103 59.8
90 to 80	--	--	--	--	81-97 66.0
80 to 80	--	71-87 64.0	87-103 61.0	--	82-98 65.1

Note: refer to Table 32 for sample size and number of sites breakdowns for the categories

Note: the first entry in each category represents the pace range while the second entry represents the percentage of vehicles in that range

TABLE 35/ TYPE OF HIGHWAY BY 85 TH PERCENTILE (KM/H) IN OCTOBER 1982, MAY 1977 AND BEFORE LEGISLATION (circa 1975) FOR EACH SPEED LIMIT CHANGE

SPEED LIMITS (BEFORE-AFTER) KM/H	OCTOBER 1982 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE	MAY 1977 FREEWAY	4 LANE DIV.	4 LANE UNDIV.	3 LANE	2 LANE
112 to 100	114.0	--	--	--	--	110.4	--	--	--	--
100 to 100	106.7	--	--	--	--	104.7	--	--	--	--
100 to 90	--	--	--	--	99.2	--	--	--	--	98.9
100 to 80	--	--	89.4	93.4	95.8	--	--	91.8	93.4	94.7
90 to 80	--	--	--	--	91.8	--	--	--	--	95.0
80 to 80	--	88.6	91.8	--	93.2	--	77.3	86.1	--	90.6

Note: refer to Table 32 for sample size and number of sites breakdowns for the categories

TABLE 35/ CONTINUED

SPEED LIMITS (BEFORE-AFTER) KM/H	BEFORE LEGISLATION (circa 1975) FREEWAY	4 LANE DIVIDED	4 LANE UNDIVIDED	3 LANE	2 LANE
112 to 100	122.8	--	--	--	--
100 to 100	100.6	--	--	--	--
100 to 90	--	--	--	--	105.3
100 to 80	--	--	95.0	99.8	103.5
90 to 80	--	--	--	--	98.2
80 to 80	--	82.1	105.5	--	100.6

Note: refer to Table 32 for sample size and number of sites breakdowns for the categories

4/ FUEL CONSUMPTION AND CONSERVATION ANALYSIS

4.1/ ANALYSIS OUTLINE AND INTRODUCTION

The following sections are concerned with the changes in fuel consumption that developed for the various highways of Ontario from October 1978 to October 1982. The implications of these changes in fuel consumption are also examined.

The study was based on methodology and analyses developed by Pierce (1) and Claffey (2) in previous Speed and Fuel Consumption reports. These reports established that fuel consumption depends upon the vehicle, the driver and the environment (route, traffic conditions, weather, etc). It was also established that, if all other factors remained constant, vehicle speed was a very important factor influencing the fuel consumption rates of automobiles, single unit trucks and multiple unit trucks. That is, a considerable savings in fuel consumption would result if the overall distribution of vehicle speeds could be reduced significantly.

4.2/ METHODOLOGY OUTLINE

The calculations of fuel consumption for the various highways of Ontario were dependent on the following assumptions:

A/ All provincial highways having speed limits of 80 km/h, 90 km/h or 100 km/h were included in the analyses.

B/ A total of 71 sites which had vehicle speed data available for both the October 1978 and October 1982 periods were selected for the analyses. These sites were used in the earlier sections of this report and were fairly representative of highway traffic in Ontario.

C/ Fuel consumption for automobiles, single unit trucks and multiple unit trucks was based on Claffey's (2) rates for straight, level pavements. These rates were modified by correction factors to take into account the greater quantity of fuel consumed under cyclic slow down conditions, up and down grades and curves. The correction factors were based on data provided in the TEE (5) and Pierce (1) reports.

D/ The 1978 and 1982 information on miles travelled for different highway types and vehicle types was obtained from MTC's highway inventory files for 1977 and 1981 respectively. Commercial traffic was divided into single and multiple unit trucks according to published percentages (see Pierce (1)).

The following sections provide the reader with more detailed methodology/ assumption outlines of speed distribution, vehicle fuel consumption and vehicle kilometres travelled as well as an algebraic presentation of the fuel consumption model.

4.2.1/ SPEED DISTRIBUTIONS

The speed distributions of October 1978 and October 1982 were obtained from the 1978 and 1982 raw data survey sheets for the 71 sites involved in the fuel consumption analyses. These sites included thirty-three (33) 100 km/h expressways, ten (10) 90 km/h King's highways and twenty-eight (28) 80 km/h King's highways.

Separate distributions of vehicle speeds were compiled for both cars and trucks and these distributions included only free-flowing traffic (see section 1.3).

It was assumed that the speed distributions for 100 km/h expressways, 90 km/h King's highways and 80 km/h King's highways represented speeds on all highways with 100 km/h limits, 90 km/h limits and 80 km/h limits respectively. It was also assumed that the speed distribution for 80 km/h King's highways was the same for 80 km/h secondary roads and that single and multiple unit trucks had the same speed distributions (see Tables 36 to 41 for October 1982 and October 1978 distribution breakdowns of highway type and vehicle type).

4.2.2/ VEHICLE FUEL CONSUMPTION

The baseline data consumption rates reported by Claffey (2) for cruising on a level highway were used in the analyses of October 1978 and October 1982 data. It should be noted that linear interpolation and extrapolation were used when necessary. The "least squares" method was not used because of a lack of data in some of the interim years.

Claffey's data was modified to adjust for normal highway driving conditions. The adjustments included increasing automobile fuel consumption by 15% for speeds at or below 55 km/h and by 9% for speeds greater than 130 km/h with linear interpolation used on the correction factors for intermediate speeds. The corrections ranged from 6% to 12% for single unit trucks and from 3% to 7% for multiple unit trucks.

Fuel consumption data in imperial gallons per kilometre (millions) and litres per 100 kilometres (millions) were outlined in Tables 42 and 43 respectively.

4.2.3/ VEHICLE KILOMETRES TRAVELLED

Data on vehicle kilometres travelled by speed limit and vehicle type for October 1978 and October 1982 were obtained from the highway inventory files of 1977 and 1981 respectively.

The highways of Ontario were grouped into the following four categories: expressways with 100 km/h speed limits, King's highways with 90 km/h speed limits, King's highways with 80 km/h speed limits and secondary roads with 80 km/h speed limits. It should be noted that kilometres driven on roads with speed limits below 80 km/h were not included in the analyses.

The split between commercial traffic (single and multiple unit trucks) and automobiles was obtained from the highway inventory file (see Table 44). The proportions used were based on the averages over the three categories of highways (expressways, King's highways and secondary roads) weighted by the amount of travel on each stretch of road.

The distributions of million vehicle kilometres driven by vehicle type and highway type for both the October 1982 and October 1978 periods were outlined in Tables 45 and 46.

4.2.4/ ALGEBRAIC PRESENTATION OF THE FUEL CONSUMPTION MODEL

The methodology involved in determining the fuel consumption for all types of vehicles at different speeds on Ontario's highways was identical to that developed by Pierce (1) in order to ensure comparability with previous fuel consumption estimates.

The following variables were used in the calculations:

FU_{ts} : The fuel use in imperial gallons per kilometre for vehicle type t at speed s.

P_{tsh} : The percent of vehicle type t at speed s on highway type h.

V_{th} : The vehicle kilometres travelled by vehicle type t on highway type h.

F_{th} : The total fuel consumption of vehicle type t on highway type h.

The formula for determining the total fuel consumption of vehicle type t at speed s was then

$$F_{th} = V_{th} \sum_{s} P_{tsh} \cdot FU_{ts}$$

Note that the calculations were carried out using imperial gallons and the totals were subsequently converted into litres (see Pierce (1) for shortcomings in data used for fuel consumption estimates).

The fuel consumption estimates were considered to be reasonable because 44.8% of all motor vehicle travel in Ontario was on the Provincial Highway System where the speed limit was 80 km/h or higher and that this travel used 37.8% of the gasoline and diesel fuel consumption of Ontario drivers.

4.3/ RESULTS OF ANALYSES

The findings indicated[5] that fuel consumption on all Ontario highways with speed limits of at least 80 km/h for all vehicles (automobiles, single and multiple unit trucks) increased by 0.313 million kilolitres (68.7 million imperial gallons) from October 1978 to October 1982. This represents a 5.03% increase in overall fuel consumption for Ontario highways (see Table 50).

Table 50 also indicated[6] that fuel consumption increased by 0.122, 0.018, 0.142 and 0.031 million kilolitres from October 1978 to October 1982 for 100 km/h expressways, 90 km/h King's highways, 80 km/h King's highways and 80 km/h secondary roads respectively.

Overall automobile, single unit truck and multiple unit truck fuel consumption rates[7] increased from October 1978 to October 1982 by 0.202, 0.034 and 0.075 million kilolitres respectively (see Tables 47 to 49).

The results also showed that fuel consumption[8] (millions of kilolitres) increased slightly (a range of 0.006 to 0.100 million kilolitres) from October 1978 to October 1982 for each highway type within all vehicle type categories (see Tables 47 to 49). Improved technology in automobile fuel efficiency was not taken into account in calculating fuel consumption. Increased speeds was the only factor used to account for the rise in fuel consumption.

In summary, the analyses showed that fuel consumption, like average speeds (see section 3.2), increased slightly from October 1978 to October 1982, independent of highway type and vehicle type.

These findings suggest that a major decrease in long term fuel consumption cannot be expected in Ontario without a major increase in both enforcement and public education.

[5,6,7,8] Note: The fuel consumption rates were estimates which were derived from methodology developed by MTC in previous reports and were based on increases in average vehicle speeds and million vehicle kilometres travelled from October 1978 to October 1982. May 1977 vehicle speed data was not available in raw form. Thus, it was necessary to use vehicle speed data from the next closest period in time, October 1978.

TABLE 36/ DISTRIBUTION OF AUTOMOBILES FOR EXPRESSWAYS (SPEED LIMIT 100 KM/H) BY VEHICLE SPEED IN OCTOBER 1982 AND OCTOBER 1978

VEHICLE SPEED KM/H	OCTOBER 1982 NUMBER	FRACTION	OCTOBER 1978 NUMBER	FRACTION
55 or less	1	0.0003	--	--
56 to 59	--	--	--	--
60 to 69	2	0.0005	2	0.000[illegible]
70 to 79	26	0.0071	43	0.0127
80 to 89	279	0.0765	216	0.0637
90 to 99	928	0.2544	870	0.2566
100 to 109	1581	0.4334	1355	0.3997
110 to 119	709	0.1944	795	0.2345
120 to 129	109	0.0300	96	0.0283
130 or over	12	0.0033	13	0.0038
TOTAL	3647	1.0000	3390	1.000

TABLE 37/ DISTRIBUTION OF TRUCKS FOR EXPRESSWAYS (SPEED LIMIT 100 KM/H) BY VEHICLE SPEED IN OCTOBER 1982 AND OCTOBER 1978

VEHICLE SPEED KM/H	OCTOBER 1982 NUMBER	FRACTION	OCTOBER 1978 NUMBER	FRACTION
55 or less	--	--	--	--
56 to 59	--	--	--	--
60 to 69	2	0.0021	3	0.0027
70 to 79	47	0.0499	27	0.0242
80 to 89	175	0.1860	167	0.1496
90 to 99	357	0.3794	485	0.4346
100 to 109	303	0.3220	361	0.3235
110 to 119	56	0.0595	71	0.0636
120 to 129	1	0.0011	2	0.0018
130 or over	--	--	--	--
TOTAL	941	1.0000	1116	1.0000

TABLE 38/ DISTRIBUTION OF AUTOMOBILES FOR KING'S HIGHWAYS (SPEED LIMIT 90 KM/H) BY VEHICLE SPEED IN OCTOBER 1982 AND OCTOBER 1978

VEHICLE SPEED KM/H	OCTOBER 1982 NUMBER	FRACTION	OCTOBER 1978 NUMBER	FRACTION
55 or less	--	--	1	0.0008
56 to 59	1	0.0009	1	0.0008
60 to 69	13	0.0128	21	0.0164
70 to 79	108	0.1060	119	0.0927
80 to 89	305	0.2993	359	0.2796
90 to 99	381	0.3739	441	0.3435
100 to 109	157	0.1541	243	0.1893
110 to 119	38	0.0373	87	0.0678
120 to 129	16	0.0157	10	0.0078
130 or over	--	--	2	0.0013
TOTAL	1019	1.0000	1284	1.0000

TABLE 39/ DISTRIBUTION OF TRUCKS FOR KING'S HIGHWAYS (SPEED LIMIT 90 KM/H) BY VEHICLE SPEED IN OCTOBER 1982 AND OCTOBER 1978

VEHICLE SPEED KM/H	OCTOBER 1982 NUMBER	OCTOBER 1982 FRACTION	OCTOBER 1978 NUMBER	OCTOBER 1978 FRACTION
55 or less	--	--	5	0.0175
56 to 59	--	--	--	--
60 to 69	10	0.0340	10	0.0350
70 to 79	44	0.1497	51	0.1783
80 to 89	99	0.3367	83	0.2902
90 to 99	91	0.3095	96	0.3357
100 to 109	45	0.1531	35	0.1224
110 to 119	5	0.0170	6	0.0210
120 to 129	--	--	--	--
130 or over	--	--	--	--
TOTAL	294	1.0000	286	1.0000

TABLE 40/ DISTRIBUTION OF AUTOMOBILES FOR KING'S HIGHWAYS (SPEED LIMIT 80 KM/H) BY VEHICLE SPEED IN OCTOBER 1982 AND OCTOBER 1978

VEHICLE SPEED KM/H	OCTOBER 1982 NUMBER	FRACTION	OCTOBER 1978 NUMBER	FRACTION
55 or less	3	0.0008	15	0.0037
56 to 59	9	0.0025	18	0.0044
60 to 69	113	0.0312	283	0.0699
70 to 79	600	0.1657	1031	0.2546
80 to 89	1511	0.4172	1462	0.3610
90 to 99	944	0.2606	877	0.2165
100 to 109	347	0.0958	272	0.0672
110 to 119	77	0.0213	83	0.0205
120 to 129	11	0.0030	9	0.0022
130 or over	7	0.0019	--	--
TOTAL	3622	1.0000	4050	1.0000

TABLE 41/ DISTRIBUTION OF TRUCKS FOR KING'S HIGHWAYS (SPEED LIMIT 80 KM/H) BY VEHICLE SPEED IN OCTOBER 1982 AND OCTOBER 1978

VEHICLE SPEED KM/H	OCTOBER 1982 NUMBER	FRACTION	OCTOBER 1978 NUMBER	FRACTION
55 or less	3	0.0058	12	0.0198
56 to 59	5	0.0097	6	0.0099
60 to 69	29	0.0562	67	0.1106
70 to 79	179	0.3469	134	0.2211
80 to 89	172	0.3333	229	0.3779
90 to 99	100	0.1938	128	0.2112
100 to 109	26	0.0504	27	0.0446
110 to 119	2	0.0039	3	0.0050
120 to 129	--	--	--	--
130 or over	--	--	--	--
TOTAL	516	1.0000	606	1.0000

TABLE 42/ FUEL USE IN IMPERIAL GALLONS PER KILOMETRE BY VEHICLE SPEED AND VEHICLE TYPE

VEHICLE SPEED KM/H	AUTOMOBILES	SINGLE UNIT TRUCKS	MULTIPLE UNIT TRUCKS
55 or less	0.027292	0.036091	0.091009
56 to 59	0.027528	0.037849	0.090592
60 to 69	0.028832	0.042333	0.095516
70 to 79	0.030756	0.047524	0.104833
80 to 89	0.032640	0.053643	0.114052
90 to 99	0.034860	0.059894	0.123174
100 to 109	0.037743	0.066386	0.132418
110 to 119	0.040830	0.072518	0.146659
120 to 129	0.043950	0.078505	0.166229
130 or more	0.045378	0.080933	0.176971

TABLE 43/ FUEL USE IN LITRES PER 100 KILOMETRES BY VEHICLE SPEED AND VEHICLE TYPE

VEHICLE SPEED KM/H	AUTOMOBILES	SINGLE UNIT TRUCKS	MULTIPLE UNIT TRUCKS
55 or less	12.4072	16.4073	41.3735
56 to 59	12.5145	17.2065	41.1839
60 to 69	13.1073	19.2450	43.4224
70 to 79	13.9820	21.6048	47.6580
80 to 89	14.8384	24.3866	51.8491
90 to 99	15.8477	27.2284	55.9960
100 to 109	17.1583	30.1797	60.1984
110 to 119	18.5617	32.9673	66.6725
120 to 129	19.9801	35.6891	75.5692
130 or more	20.6292	36.7929	80.4526

TABLE 44/ PERCENT OF COMMERCIAL AND NON-COMMERCIAL VEHICLES BY TYPE OF VEHICLE AND HIGHWAY

TYPE OF VEHICLE	EXPRESSWAY	KING'S HIGHWAY	SECONDARY ROAD
AUTOMOBILES	78.500	81.700	79.400
SINGLE UNIT TRUCKS	10.191	8.674	9.764
MULTIPLE UNIT TRUCKS	11.309	9.626	10.836
TOTAL	100.0	100.0	100.0

TABLE 45/ DISTRIBUTION OF VEHICLE KILOMETRES TRAVELLED (IN MILLIONS) BY VEHICLE TYPE AND HIGHWAY TYPE IN OCTOBER 1978

HIGHWAY TYPE	AUTOMOBILES	SINGLE UNIT TRUCKS	MULTIPLE UNIT TRUCKS	TOTAL
EXPRESSWAY 100 km/h	10,639.211	1,381.200	1,532.725	13,553.136
KING'S HIGHWAYS 90 km/h	2,389.935	253.742	281.579	2,925.256
KING'S HIGHWAYS 80 km/h	10,313.405	1,094.963	1,215.139	12,623.507
SECONDARY ROADS 80 km/h	530.936	65.298	72.462	668.696
TOTAL	23,873.487	2,795.203	3,101.905	29,770.595

Note: 1977 data was used to derive the distributions of vehicle kilometres travelled

TABLE 46/ DISTRIBUTION OF VEHICLE KILOMETRES TRAVELLED (IN MILLIONS) BY VEHICLE TYPE AND HIGHWAY TYPE IN OCTOBER 1982

HIGHWAY TYPE	AUTOMOBILES	SINGLE UNIT TRUCKS	MULTIPLE UNIT TRUCKS	TOTAL
EXPRESSWAY 100 km/h	11,123.725	1,444.100	1,602.525	14,170.350
KING'S HIGHWAYS 90 km/h	2,456.721	260.827	289.474	3,007.022
KING'S HIGHWAYS 80 km/h	10,782.666	1,144.784	1,270.407	13,197.857
SECONDARY ROADS 80 km/h	647.554	79.631	88.374	815.559
TOTAL	25,010.666	2,929.342	3,250.780	31,190.788

TABLE 47/ FUEL CONSUMPTION IN OCTOBER 1982 AND OCTOBER 1978 FOR AUTOMOBILES IN MILLIONS OF KILOLITRES (MILLIONS OF IMPERIAL GALLONS) BY HIGHWAY TYPE

HIGHWAY TYPE	OCTOBER 1982	OCTOBER 1978	INCREASE	% INCREASE
EXPRESSWAYS 100 km/h	1.890 (415.69)	1.814 (399.06)	0.076 (16.63)	4.19
KING'S HIGHWAYS 90 km/h	0.384 (84.72)	0.378 (83.16)	0.006 (1.56)	1.59
KING'S HIGHWAYS 80 km/h	1.642 (361.13)	1.542 (338.98)	0.100 (22.15)	6.49
SECONDARY ROADS 80 km/h	0.099 (21.69)	0.079 (17.45)	0.020 (4.24)	25.32
TOTAL	4.015 (883.23)	3.813 (838.65)	0.202 (44.58)	5.30

TABLE 48/ FUEL CONSUMPTION IN OCTOBER 1982 AND OCTOBER 1978 FOR SINGLE UNIT TRUCKS IN MILLIONS OF KILOLITRES (MILLIONS OF IMPERIAL GALLONS) BY HIGHWAY TYPE

HIGHWAY TYPE	OCTOBER 1982	OCTOBER 1978	INCREASE	% INCREASE
EXPRESSWAYS 100 km/h	0.400 (88.13)	0.386 (85.01)	0.014 (3.12)	3.63
KING'S HIGHWAYS 90 km/h	0.067 (14.75)	0.062 (13.74)	0.005 (1.01)	8.06
KING'S HIGHWAYS 80 km/h	0.274 (60.17)	0.262 (57.51)	0.012 (2.66)	4.58
SECONDARY ROADS 80 km/h	0.019 (4.19)	0.016 (3.43)	0.003 (0.76)	18.75
TOTAL	0.760 (167.24)	0.726 (159.69)	0.034 (7.55)	4.68

TABLE 49/ FUEL CONSUMPTION IN OCTOBER 1982 AND OCTOBER 1978 FOR MULTIPLE UNIT TRUCKS IN MILLIONS OF KILOLITRES (MILLIONS OF IMPERIAL GALLONS) BY HIGHWAY TYPE

HIGHWAY TYPE	OCTOBER 1982	OCTOBER 1978	INCREASE	% INCREASE
EXPRESSWAYS 100 km/h	0.910 (200.20)	0.877 (192.89)	0.033 (7.31)	3.76
KING'S HIGHWAYS 90 km/h	0.156 (34.22)	0.150 (33.05)	0.006 (1.17)	4.00
KING'S HIGHWAYS 80 km/h	0.648 (142.63)	0.620 (136.33)	0.028 (6.30)	4.52
SECONDARY ROADS 80 km/h	0.045 (9.92)	0.037 (8.13)	0.008 (1.79)	21.62
TOTAL	1.759 (386.97)	1.684 (370.40)	0.075 (16.57)	4.45

TABLE 50/ FUEL CONSUMPTION IN OCTOBER 1982 AND OCTOBER 1978 FOR ALL VEHICLES (TOTAL) IN MILLIONS OF KILOLITRES (MILLIONS OF IMPERIAL GALLONS) BY HIGHWAY TYPE

HIGHWAY TYPE	OCTOBER 1982	OCTOBER 1978	INCREASE	% INCREASE
EXPRESSWAYS 100 km/h	3.200 (704.02)	3.078 (676.96)	0.122 (27.06)	3.96
KING'S HIGHWAYS 90 km/h	0.608 (133.69)	0.590 (129.95)	0.018 (3.74)	3.05
KING'S HIGHWAYS 80 km/h	2.564 (563.93)	2.422 (532.82)	0.142 (31.11)	5.86
SECONDARY ROADS 80 km/h	0.163 (35.8)	0.132 (29.01)	0.031 (6.79)	23.48
TOTAL	6.535 (1437.44)	6.222 (1368.74)	0.313 (68.70)	5.03

5/ SUMMARY

5.1/ SUMMARY OF THE 1982 SPEED STATISTICS ANALYSES

The analyses of the October 1982 speed statistics are summarized in the following sections:

5.1.1/ 1982 SPEED STATISTICS

The weighted average speeds for highways with before-after speed limits of 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 km/h were 100.9, 97.9, 92.7, 84.4, 84.8 and 83.4 km/h respectively. These average speeds were higher than the posted speed limits of their respective highways for all categories except the 100-100 speed limit category.

The average highest recorded speeds for the 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 km/h speed limit categories were 121.2, 121.4, 116.4, 115.1, 103.0 and 109.5 km/h respectively while the lowest recorded speeds for these highways were 77.3, 77.0, 69.4, 64.4, 66.0 and 60.7 km/h respectively.

Drivers travelling on highways with before-after speed limits of 100-80 km/h and 90-80 km/h were significantly less likely to be compliant (32.0% and 32.5% respectively) than drivers travelling on highways with before-after speed limits of 80-80, 100-90, 112-100 and 100-100 km/h (41.7%, 47.0%, 49.5% and 68.4% respectively).

Overall, 44.7% of the drivers were compliant to the posted speed limits.

The pace range for the 112-100 km/h speed limit category was 93 to 109 km/h. The pace ranges for the 100-100, 100-90, 100-80, 90-80 and 80-80 km/h speed limit categories were 90 to 106, 85 to 101, 77 to 93, 79 to 95 and 76 to 92 km/h respectively.

The percentage of vehicles in the pace did not vary greatly by speed limit category (a range of 67.3% for the 100-80 km/h category to 72.1% for the 112-100 km/h category. Overall results for the sample showed that 70.1% of the vehicles were travelling in the pace.

The standard deviations in operating speeds for each speed limit category were similiar (a range of 7.23 km/h for the 90-80 speed limit category to 9.16 km/h for the 80-80 speed limit category). The overall standard deviation in operating speeds for the sample was 8.58 km/h.

The 85 th percentiles for the 112-100, 100-100, 100-90, 100-80, 90-80 and 80-80 before-after speed limit categories were 108.7, 105.8, 100.1, 94.7, 91.8 and 92.3 km/h respectively.

5.1.2/ 1982 SPEED STATISTICS BY AADT LEVEL

The medium and low volume areas of 112-100 km/h highways had higher average speeds (103.0 km/h and 105.1 km/h respectively) than the high volume areas of these highways (98.9 km/h). The average speeds for the other speed limit categories also varied by AADT level.

Drivers were significantly more likely to be compliant to the posted speed limits on the high volume areas of 112-100, 100-100 and 80-80 km/h highways (54.0%, 73.8% and 48.0% respectively) in comparison to the medium (39.2%, 64.5% and 17.0% respectively) and low (32.1%, 65.5% and 41.0% respectively) volume areas of these highways.

The pace was similar for the three AADT levels (high, medium and low) within most of the before-after speed limit categories.

The percentage of vehicles in the pace did not vary greatly by AADT level for highways with before-after speed limits of 112-100 km/h and 100-80 km/h; in comparison, the percentage of vehicles in the pace was more variable by AADT level for highways with 100-100, 100-90 and 80-80 km/h before-after speed limits.

The standard deviations in operating speeds varied slightly by AADT level for each speed limit category.

The results of the survey also showed that very little variation in the 85 th percentile existed between the three AADT levels within each before-after speed limit category.

5.1.3/ 1982 SPEED STATISTICS BY HIGHWAY TYPE

The average speeds were similar for each type of highway within the various speed limit categories.

The percentage of drivers who were compliant varied greatly by the type of highway. Overall results indicated that 67.0%, 50.3%, 43.8%, 38.4% and 30.0% of the drivers who were travelling on 4 lane divided highways, freeways, 4 lane undivided highways, 2 lane highways and 3 lane highways respectively were compliant to the posted speed limits.

The pace was similar for each type of highway within most of the before-after speed limit categories.

The percentage of vehicles in the pace varied by highway type for most of the speed limit categories (100-100, 100-90, 100-80 and 80-80 km/h categories).

The standard deviations in operating speeds by type of highway never varied by more than 3.0 km/h for each speed limit category.

The speed below which 85% of the drivers were travelling was similar for each highway type within the 100-100, 100-90, 100-80 and 80-80 km/h speed limit categories.

5.2/ SUMMARY OF COMPARISONS OF OCTOBER 1982 AND MAY 1977 SPEED STATISTICS

The comparisons of the October 1982 and May 1977 speed statistics are summarized in the following sections:

5.2.1/ COMPARISONS OF 1982 AND 1977 SPEED STATISTICS

The average speed for most of the speed limit categories increased from May 1977 to October 1982. The average speeds increased by 3.7 km/h (101.1 to 104.8 km/h), 3.0 km/h (95.2 to 98.2 km/h), 2.9 km/h (83.6 to 86.5 km/h) and 1.7 km/h (81.1 to 82.8 km/h) for the 112-100, 100-100, 100-80 and 80-80 km/h speed limit categories respectively. Average speeds were unchanged (90.5 km/h) for the 100-90 km/h speed limit category and decreased by 5.7 km/h (90.5 to 84.8 km/h) for the 90-80 km/h speed limit category.

The average highest recorded speeds decreased significantly (a drop of 14.5 km/h) from May 1977 to October 1982 for the 90-80 km/h speed limit category and decreased less significantly for the 100-90 (down 5.3 km/h), 100-100 (down 4.1 km/h) and 100-80 (down 1.0 km/h) speed limit categories. In comparison, the average highest recorded speeds increased by 5.7 km/h and 1.3 km/h for the 80-80 and 112-100 km/h speed limit categories.

The average lowest recorded speeds increased by 8.9 km/h for the 100-100 km/h speed limit category and remained similiar for the other speed limit categories.

The percentage of drivers who were compliant increased significantly for the 100-100 and 100-90 km/h speed limit categories (+13.8% and +6.5% respectively) and decreased significantly for the 100-80, 90-80 and 80-80 km/h speed limit categories (-10.3%, -9.5% and -22.6% respectively). Compliancy remained relatively unchanged (33.5% to 31.3%) for the 112-100 km/h speed limit category.

Overall compliancy decreased by 6.9% from May 1977 to October 1982.

The pace range increased by 1 to 4 km/h for the 112-100, 100-100, 90-80 and 80-80 km/h speed limit categories and remained the same for the 100-90 and 100-80 speed limit categories.

The percentage of vehicles in the pace increased significantly for the 90-80 km/h speed limit category and remained relatively unchanged for the other speed limit categories.

The overall percentage of vehicles in the pace for the sample decreased by 0.8% which indicated that, in general, the traffic flow on the highways of Ontario had not changed from May 1977 to October 1982.

The 85 th percentiles decreased slightly from May 1977 to October 1982 for the 90-80 speed limit category (-3.2 km/h) and increased slightly for the other speed limit categories (a range of +0.3 to +4.5 km/h).

The standard deviations in operating speeds increased by 0.15 km/h for the 100-90 km/h speed limit category and decreased (a range of 0.69 to 2.75 km/h) for the other speed limit categories.

5.2.2/ COMPARISONS OF 1982 AND 1977 SPEED STATISTICS BY AADT LEVEL

Overall results for the sample indicated that compliancy decreased by 9.5%, 10.5% and 6.4% from May 1977 to October 1982 for the high (44.4% to 34.9%), medium (50.3% to 39.8%) and low (38.1% to 31.7%) volume areas respectively of Ontario highways.

The pace range either remained the same or increased by 3 km/h or less for most of the AADT levels within the various speed limit categories.

The comparisons of May 1977 and October 1982 percent in pace by AADT level categories for the various speed limit groups indicated that the percentage of vehicles in the pace increased for most low volume areas, decreased for most medium volume areas and all high volume areas.

The speed below which 85% of the drivers were travelling (85 th percentile) either remained relatively the same or increased for the various AADT level by speed limit categories.

5.2.3/ COMPARISONS OF 1982 AND 1977 SPEED STATISTICS BY TYPE OF HIGHWAY

The overall results for the sample indicated that the compliancy rates of drivers travelling on freeways increased slightly from May 1977 to October 1982 (37.8% to 39.6%) and decreased significantly for drivers travelling on 2 lane (42.8% to 34.9%), 3 lane (36.0% to 30.0%), 4 lane undivided (64.3% to 46.3%) and 4 lane divided (92.0% to 63.0%) highways.

The pace range at which the greatest percentage of drivers were travelling either remained the same or increased slightly for most of the highway type by speed limit categories.

The percentage of drivers in the pace remained relatively unchanged for 112-100 km/h and 100-100 km/h freeways and either increased or decreased for the other type of highway by speed limit categories.

The speed below which 85% of the drivers were travelling (85 th percentile) remained relatively the same (±3.6 km/h) for most of the type of highway by speed limit categories.

5.3/ SUMMARY OF FUEL CONSUMPTION AND CONSERVATION ANALYSIS

Fuel consumption on all Ontario highways with speed limits of at least 80 km/h increased by 0.313 million kilolitres (68.7 million imperial gallons) for all vehicles (automobiles, single unit trucks and multiple unit trucks) from October 1978 to October 1982.

The results also showed that fuel consumption increased by 0.122, 0.018, 0.142 and 0.031 million kilolitres for 100 km/h expressways, 90 km/h King's highways, 80 km/h King's highways and 80 km/h secondary roads respectively from October 1978 to October 1982.

Overall automobile, single unit truck and multiple unit truck consumption rates increased by 0.202, 0.034 and 0.075 million kilolitres respectively from October 1978 to October 1982.

It should be noted that the above increases in fuel consumption were related to increases in average vehicle speeds and million vehicle kilometres travelled from October 1978 to October 1982.

6/ BIBLIOGRAPHY

1/ Pierce, Janace A., Managing Highway Operating Speeds for Energy Conservation, Ministry of Transportation and Communications, Ontario.

2/ Claffey, Paul J. and Paul J.Claffey and Associates, Running Costs of Motor Vehicles as Affected by Road Design and Traffic, Highway Research Board, Division of Engineering, National Research Council, National Academy of Engineering.

3/ Gardner, N.G., The Effects of Reduced Speed Limits on Motor Vehicles Operating in Ontario, Ministry of Transportation and Communications, Ontario.

4/ Gardner, N.G., P.B. Young and A.P. Cunliffe, Reduced Speed Limits in Ontario- Their Effects on Motor Vehicle Operating Speeds and Energy Consumption, Ministry of Transportation and Communications, Ontario.

5/ TEE Consulting Services, Reduced Vehicle Speeds in Ontario, Ministry of Transportation and Communications, Ontario.

APPENDIX A/ BREAKDOWN OF SURVEY SITES FOR OCTOBER 1982 SURVEY

SITE NUMBER	REGION	HWY #	SPEED LIMITS	HIGHWAY TYPE	VOLUME	LOCATION DESCRIPTION
1	EAST	401	112-100	Freeway	Low	Hwy 401, 1.4 km E of Upper Canada Road
2	EAST	401	112-100	Freeway	Low	Hwy 401, 1.0 km E of Wilton Road
3	EAST	417	112-100	Freeway	Low	3.1 km E of Hwy 138 intersection
4	EAST	2	100-80	2 Lane	High	0.9 km W of [illegible]dbine Road
5	EAST	2	100-80	2 Lane	Low	2.4 km W of Junction Hwy 31 (Morrisburg)
6	EAST	2	80-80	4 Lane Undivided	High	1.6 km W of Loyalist Road
7	EAST	7	100-80	2 Lane	Medium	2.7 km E of Junction Hwy 15&29
8	EAST	14	100-80	2 Lane	Medium	0.6 km E of City Road Road (Prince Edward)
9	EAST	14	100-80	2 Lane	Medium	0.2 km S of Hastings Road 5
10	EAST	15	100-80	2 Lane	Medium	4.0 km N of Joyceville Road
11	EAST	15	100-80	2 Lane	Medium	1.9 km N of Gore Road (4.3 km N of Hwy 2)
12	EAST	17	100-80	2 Lane	High	0.9 km W of Carleton Street
13	EAST	62	100-80	2 Lane	Low	2.1 km S of Huntington Concession Road II
14	NORTH	11	100-90	2 Lane	Medium	3.2 km N of Best-Gillies Township
15	NORTH	11	100-100	2 Lane	High	Junction Muskoka Road 10 & Secondary Hwy 141
16	NORTH	17	100-90	2 Lane	Medium	1 km W of Hwy 68
17	NORTH	69	100-80	2 Lane	Medium	0.3 km NE of Torrance Road
18	NORTH	69	100-80	2 Lane	Medium	0.2 km N of Walker's Road (Muskoka Road #10)
19	NORTH	144	80-80	2 Lane	High	0.5 km S of Notre Dame St
20	CENTRAL	401	112-100	Freeway	High	McCowan Road Eastbound Driving
21	CENTRAL	401	112-100	Freeway	High	McCowan Road Eastbound Centre Right
22	CENTRAL	401	112-100	Freeway	High	McCowan Road Eastbound Centre Left

APPENDIX A/ (CONTINUED)

SITE NUMBER	REGION	HWY #	SPEED LIMITS	HIGHWAY TYPE	VOLUME	LOCATION DESCRIPTION
23	CENTRAL	401	112-100	Freeway	High	McCowan Eastbound Core Passing
24	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Collector Drive
25	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Collector Centre
26	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Collector Passing
27	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Core Driving
28	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Core Right Centre
29	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Core Left Centre
30	CENTRAL	401	112-100	Freeway	High	McCowan Westbound Core Passing
31	CENTRAL	401	112-100	Freeway	High	McCowan Eastbound Collector Drive
32	CENTRAL	401	112-100	Freeway	High	McCowan Eastbound Collector Centre
33	CENTRAL	401	112-100	Freeway	High	McCowan Eastbound Collector Passing
34	CENTRAL	24	100-80	2 Lane	High	0.5 km S of Hwy 53
35	CENTRAL	28	80-80	2 Lane	Medium	0.8 km N of Rice Lake Drive
36	CENTRAL	24	100-80	4 Lane Undivided	Medium	0.3 km S of Hwy 5
37	CENTRAL	11	100-80	2 Lane	High	0.8 km S of Poplar Banks Side Road
38	CENTRAL	7	100-80	2 Lane	High	0.5 km W of N Junction Hwy 10
39	CENTRAL	7	100-80	2 Lane	Medium	0.5 km E of City Road 6 (Victoria)
40	CENTRAL	7	80-80	4 Lane Divided	High	0.2 km E of Concord Road
41	CENTRAL	QEW	100-100	Freeway	Low	Between Bowen Road and Netherby Road
42	CENTRAL	QEW	100-100	Freeway	Medium	Between Torold Stone Road and Mountain Road
43	CENTRAL	401	112-100	Freeway	High	Weston Road Eastbound Collector Drive

APPENDIX A/ (CONTINUED)

SITE NUMBER	REGION	HWY #	SPEED LIMITS	HIGHWAY TYPE	VOLUME	LOCATION DESCRIPTION
44	CENTRAL	401	112-100	Freeway	High	Weston Road Eastbound Collector Centre
45	CENTRAL	401	112-100	Freeway	High	Weston Road Eastbound Collector Passing
46	CENTRAL	401	112-100	Freeway	High	Weston Road Eastbound Core Driving
47	CENTRAL	401	112-100	Freeway	High	Weston Road Eastbound Core Centre
48	CENTRAL	401	112-100	Freeway	High	Weston Road Eastbound Core Passing
49	CENTRAL	401	112-100	Freeway	High	Weston Road Westbound Collector Driving
50	CENTRAL	401	112-100	Freeway	High	Weston Road Westbound Collector Centre
51	CENTRAL	401	112-100	Freeway	High	Weston Road Westbound Collector Passing
52	CENTRAL	401	112-100	Freeway	High	Weston Road Westbound Core Driving
53	CENTRAL	401	112-100	Freeway	High	Weston Road Westbound Core Centre
54	CENTRAL	401	112-100	Freeway	High	Weston Road Westbound Core Passing
55	CENTRAL	401	112-100	Freeway	Low	Between Hwy 30 & Percy Street
56	CENTRAL	401	112-100	Freeway	Medium	Between Hwy 25 & Campbelleville Side Road
57	CENTRAL	6	100-80	2 Lane	High	16.1 km S of Hwy 401
58	CENTRAL	53	100-80	2 Lane	Medium	0.6 km W of Hwy 24
59	NORTH-WEST	17	100-90	2 Lane	Medium	10.8 km E of Ont/Man Border
60	NORTH-WEST	11	100-90	2 Lane	Low	16.1 km W of Tertiary Road 801
61	NORTH-WEST	11&17	100-90	2 Lane	Medium	0.4 km W of Mapleward Road
62	NORTH-WEST	17	100-90	2 Lane	Medium	0.2 km W of Mississauga Indian Reservation
63	NORTH-WEST	17	100-90	2 Lane	Medium	2.4 km E of Garden River Indian Reservation
64	NORTH-WEST	17	100-90	2 Lane	Low	2.4 km E of Little Pic River Bridge
65	NORTH-WEST	17	100-90	2 Lane	Low	1.5 km W of Junction Highway 71

APPENDIX A/ (CONTINUED)

SITE NUMBER	REGION	HWY #	SPEED LIMITS	HIGHWAY TYPE	VOLUME	LOCATION DESCRIPTION
66	NORTH-WEST	11	100-90	2 Lane	Low	10.2 km E of Glenarchy Road
67	NORTH-WEST	71	80-80	2 Lane	Low	0.7 km N of Sabaskong Bay Road (Nestor Falls)
68	SOUTH-WEST	401	112-100	Freeway	Medium	1.6 km E of Hwy 126
69	SOUTH-WEST	401	112-100	Freeway	Low	1.8 km W of Highgate Road
70	SOUTH-WEST	400	112-100	Freeway	Medium	1.6 km S of Hwy 89 Junction
71	SOUTH-WEST	400	100-100	2 Lane	Medium	0.8 km N of Hwy 93 (400 Extension)
72	SOUTH-WEST	3	100-80	2 Lane	Medium	0.3 km W of Elgin City Road 35
73	SOUTH-WEST	3	100-80	2 Lane	Low	0.8 km W of Elgin City Road 19
74	SOUTH-WEST	7	100-80	3 Lane	Medium	0.8 km W of Plympton Road 9-10
75	SOUTH-WEST	11	90-80	2 Lane	Medium	3.7 km S of Simcoe City Road 21
76	SOUTH-WEST	11	100-90	4 Lane Undivided	High	4.5 km N of Junction Hwy 11B
77	SOUTH-WEST	21	90-80	2 Lane	Medium	0.8 km N of Erniskillen Road 6
78	SOUTH-WEST	27	100-80	2 Lane	Medium	2.9 km S of Junction City Road 22
79	SOUTH-WEST	126	100-100	4 Lane Divided	High	1.6 km S of Commissioners Road

VEHICLE SPEED STUDY

Highway No. _ _ _ _ _ _ _ _ Location. .
Region _ _ _ _ _ _ _ _ Municipality.
Date _ _ _ _ _ Time period Direction: _
Study conditions Existing speed limit
Dist. from radar to edge of pavement _ _ _ (ft) Operator _
Weather: clear, partly cloudy, cloudy, sunshine, rain, snow, fog
Light: bright, dull, dusk, dark.
Road surface: Type: _ _ _ _ _ Width _ _ _ (ft)
Shoulders. Type: _ _ _ _ _ Width _ _ _ _ _ (ft)
Median. Type: _ _ _ _ _ Width: _ _ _ (ft)
Sidewalks. Type: _ _ _ _ _ _ Width. _ _ _ _ (ft)

Tuning fork calibration

Fork	Begin	End
30	_ _ _	_ _ _
50	_ _ _	_ _ _
60	_ _ _	_ _
Est 85 %-ile _ _ _		

SPEED (S)	CARS AND LIGHT VEHICLES	TOTAL (f)	CUM TOTAL	TRUCKS					
				2 AXLE	TOT (f)	CUM TOTAL	OTHER	TOT (f)	CUM TOTAL
OVER									
82									
80									
78									
76									
74									
72									
70									
68									
66									
64									
62									
60									
58									
56									
54									
52									
50									
48									
46									
44									
42									
40									
38									
36									
34									
32									
30									
28									
26									
24									
22									
20									
18									
16									
14									
12									
10									
8									
UNDER									
TOTAL									

APPENDIX C/ SPEED STATISTICS BY REGION BY SPEED LIMIT CATEGORY (KM/H) IN OCTOBER 1982

SAMPLE SIZE AND NUMBER OF SITES

REGION	112-100	100-100	100-90	100-80	90-80	80-80	TOTAL
NORTHWEST	--	--	N=605 (8)	--	--	N=44 (1)	N=649 (9)
NORTH	--	N=100 (1)	N=100 (2)	N=100 (2)	--	N=50 (1)	N=350 (6)
SOUTHWEST	N=301 (3)	N=200 (2)	N=100 (1)	N=357 (4)	N=179 (2)	--	N=1137 (12)
CENTRAL	N=2819 (28)	N=200 (2)	--	N=711 (7)		N=205 (2)	N=3935 (39)
EAST	N=300 (3)	--	--	N=799 (8)	--	N=200 (2)	N=1299 (13)
TOTAL	N=3420 (34)	N=500 (5)	N=805 (11)	N=1967 (21)	N=179 (2)	N=499 (6)	N=7370 (79)

Note: the first entry in each category represents the sample size while the second entry represents the number of sites

AVERAGE SPEED (KM/H)

REGION	112-100	100-100	100-90	100-80	90-80	80-80
NORTHWEST	--	--	90.1	--	--	82.1
NORTH	--	93.5	94.5	81.3	--	86.8
SOUTHWEST	104.0	98.1	94.0	85.2	84.8	--
CENTRAL	99.0	98.1	--	81.7	--	83.8
EAST	106.4	--	--	90.8	--	80.3
TOTAL	100.9	97.9	92.7	84.4	84.8	83.4

APPENDIX C/ (CONTINUED)

HIGHEST RECORDED SPEED (AVERAGE) IN KM/H

REGION	112-100	100-100	100-90	100-80	90-80	80-80
NORTHWEST	--	--	117.2	--	--	114.3
NORTH	--	120.8	114.3	105.5	--	114.3
SOUTHWEST	128.8	123.2	114.3	111.9	103.0	--
CENTRAL	119.1	119.9	--	107.2	--	112.7
EAST	132.5	--	--	126.2	--	101.4
TOTAL	121.2	121.4	116.4	115.1	103.0	109.5

LOWEST RECORDED SPEED (AVERAGE) IN KM/H

REGION	112-100	100-100	100-90	100-80	90-80	80-80
NORTHWEST	--	--	67.0	--	--	53.1
NORTH	--	69.2	78.1	61.2	--	75.7
SOUTHWEST	85.8	78.9	70.8	68.4	66.0	--
CENTRAL	75.5	78.9	--	57.8	--	58.8
EAST	85.3	--	--	68.7	--	58.8
TOTAL	77.3	77.0	69.4	64.4	66.0	60.7

APPENDIX C/ (CONTINUED)

PERCENT COMPLIANT

REGION	112-100	100-100	100-90	100-80	90-80	80-80	TOTAL
NORTHWEST	--	--	49.9	--	--	41.0	48.9
NORTH	--	76.5	39.5	47.5	--	22.0	45.4
SOUTHWEST	38.8	68.5	39.0	37.0	32.5	--	42.1
CENTRAL	53.3	64.3	--	43.1	--	40.0	51.4
EAST	24.3	--	--	15.9	--	53.5	23.6
TOTAL	49.5	68.4	47.0	32.0	32.5	41.7	44.7

PACE (16 KM/H SPEED BAND IN WHICH THE GREATEST PERCENTAGE OF VEHICLES WERE TRAVELLING)

REGION	112-100	100-100	100-90	100-80	90-80	80-80
NORTHWEST	--	--	84-100	--	--	77-93
NORTH	--	90-106	87-103	72-88	--	79-95
SOUTHWEST	97-113	90-106	89-105	77-93	79-95	--
CENTRAL	92-103	92-108	--	76-92	--	77-93
EAST	100-116	--	--	82-98	--	74-90
TOTAL	93-109	90-106	85-101	77-93	79-95	76-92

APPENDIX C/ (CONTINUED)

PERCENT IN PACE

REGION	112-100	100-100	100-90	100-80	90-80	80-80	TOTAL
NORTHWEST	--	--	68.9	--	--	64.5	68.4
NORTH	--	64.0	71.0	63.0	--	76.0	68.0
SOUTHWEST	74.3	68.8	76.5	67.5	68.5	--	70.3
CENTRAL	72.1	72.0	--	68.4		64.0	71.0
EAST	70.5	--	--	67.3	--	74.0	69.1
TOTAL	72.1	69.1	70.0	67.3	68.5	69.4	70.1

STANDARD DEVIATIONS IN OPERATING SPEEDS (KM/H)

REGION	112-100	100-100	100-90	100-80	90-80	80-80
NORTHWEST	--	--	9.35	--	--	9.63
NORTH	--	9.21	9.13	8.94	--	11.64
SOUTHWEST	7.66	8.26	6.31	8.05	7.23	--
CENTRAL	8.18	7.65	--	8.87	--	9.26
EAST	9.32	--	--	9.56	--	7.58
TOTAL	8.23	8.21	9.03	8.98	7.23	9.16